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I, JULIE BILLINGSLEY, TEAM LEADER EXAMINATION SUPPORT AND SALES hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. 2004903111 for a patent by YARRA RIDGE PTY LTD as filed on 01 June 2004.

WITNESS my hand this
Fourteenth day of July 2004

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Background to the Invention

Aluminium framed French Doors, as defined below, typically employ a lock having a first portion that is morticed into the frame of the closing edge and handle assemblies that are mounted one on each side of the wing adjacent the first portion. Nowadays, these doors are often closed against a strip of compressible sealing material located between the door and an element defining in-part the opening and against which the wing closes (this strip being to prevent energy loss) - this action sometimes requiring a not insignificant force.

These doors can be urged in a closing direction by the inclusion of remote plunger-like members that are driven into receiving apertures of upper and lower elements of the opening and/or the inclusion of a lock having a suitably shaped bolt (described below) that is urged outwardly by the operating levers (as described below).

Typically locks for common French Doors comprise a first portion comprising a lock body of small depth and not more than about 40MM, a small setback not exceeding about 30MM, a small width not exceeding about 16 MM, a bolt that can extend at least 15 MM from the lock body and preferably means to displace rods at least 15 MM. Preferably, an industry standard for the distance between the cylinder and lever axii of 85.00 MM should also be observed. Typically locks for common Security Doors require the lock to have a smaller lock body having depth not exceeding about 40MM, a setback of about 27MM, a width of about 14.5 MM, a bolt that can extend at least 14 MM from the lock body and preferably means to drive rods or cables at least 11 MM. Preferably, the lock should also comply with the industry standard fitting apertures within the door.

In each case, it is difficult to comply with the space requirements imposed by the conditions described above because bolts need to extend adequately into the casing when fully extended to be properly supported and this imposes restrictions on integers competing for space adjacent the bolt and because the lock body must fit within a frame. These conditions place restrictions on the bolt, casing and other component depths and widths that also must observe minimum strength requirements. Furthermore, it is preferable that the locks comply with the Australian standards for Security Doors, Glass Doors, Locksets and Fire Doors - these standards defining minimum performance levels for strength, durability, corrosion resistance, ease of use and other functional and performance requirements.

Locks commonly employed in French doors in Australia do not provide compression, they are lockable only by key and it is not possible to lock the exterior

lever while leaving the interior lever free to operated to enable egress and in many applications this is inconvenient and in some applications it is unsafe.

Locks commonly employed in security doors in Australia do have locking by interior locking lever (snib lever) but do not provide for locking of the exterior lever while retaining the interior lever free to be operated to enable egress.

The inventions herein, include locks that address the inadequacies described above.

The inventions herein, comprise improved complete locks and improvements for locks for displaceable wings that are not just limited to addressing the above described inadequacies of common Security and French Doors.

Summary of the Invention Some Claims defining the Invention Are:

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Definitions and Conventions Employed – after amended @ 5/4/04

This specification and the provisional applications associated with this application, describe inventions comprising improved complete locks for displaceable wings and improvements for locks for displaceable wings that (for convenience) are referred to herein as "locks" and throughout this specification and claims which follow, unless the context requires otherwise, the word "locks" or variations such as "lock" will be understood to imply the inclusion of complete locks for displaceable wings and improvements for locks for displaceable wings that are transportable into other locks and locking devices without being limited to the complete locks described herein.

This specification describes locks substantially as described herein with reference to and as illustrated in the accompanying drawings.

Throughout this specification and claims which follow, unless the context requires otherwise, the word "comprise", or variations such as "comprises" or "comprising", will be understood to imply the inclusion of a stated integer or group of integers but not the exclusion of any other integer or group of integers.

Throughout this specification and claims which follow, unless the context requires otherwise, the positional prepositions such as rear, forward are used to assist in description of the preferred embodiments and with reference to the accompanying drawings and have in general no absolute significance.

Throughout this specification and claims which follow, unless the context requires otherwise, the word "preferably" or variations such as "prefer" does not mean nor infer that that the inventions described in the "Description of the Preferred

Embodiments" are necessarily restricted to the form of an integer or collection of integers referred to as preferred.

Throughout this specification and claims which follow, unless the context requires otherwise, the words wing embraces both doors and windows.

Throughout this specification and claims which follow, unless the context requires otherwise:

An engaging member in use with an engageable means is displaceable between an operative disposition, the disposition in which the bolt finds itself when engaged with the engageable means and an inoperative disposition removed from the said engagement. In isolated use, the engaging member is displaceable between a fully displaced disposition and a fully retracted disposition – in both latter dispositions the engageable means not acting to limit the displacement.

In the case of a rectilinearly displaceable bolt for hinged doors, in the inoperative configuration the bolt is withdrawn from the strike plate aperture and in the operative configuration the bolt is within the aperture of a strike plate – in this case the operative disposition generally corresponds to a fully extended bolt while the inoperative disposition generally corresponds to a bolt substantially within the lock casing;

Latching means displacement of an engaging member into engagement with the engageable means under the action of biasing means and latching in relation to hinged doors generally comprises:'1) displacement (rectilinear and/or angular) of a latch bolt or {advanced latch bolt and an auxiliary bolt as defined below} towards the lock casing by the strike plate and subsequent displacement of the latch bolt into the aperture of the strike plate to the operative disposition - in conventional forms this comprises displacement of the latch bolt by a curved or angled wing or lip of the strike plate, or 2) displacement of an auxiliary bolt towards the casing by the strike plate or other member to release the engaging member to enable it to be displaced (rectilinearly and/or angularly) by biasing means to an operative position where a portion is engaged with the strike plate.

Latching in relation to sliding wings generally comprises: '1) displacement (rectilinear and/or angular) of an engaging member having a hooking portion towards the lock casing and subsequent displacement of the engaging member to an operative disposition where a portion is behind a shoulder of the catch plate to enable the hook to overlap the shoulder whereby to longitudinally engage the catch plate, or '2) displacement of an auxiliary bolt towards the casing to release an engaging member having a hooking portion to displace (rectilinearly and/or angularly) to an operative disposition where a portion is behind a shoulder of the catch plate to

enable the hook to overlap the shoulder whereby to longitudinally engage the catch plate, or '3) rectilinear displacement of an advanced latch bolt (as defined below) with hooking arms and an auxiliary bolt towards the lock casing by the catch plate and subsequent displacement of the latch bolt into the aperture of the catch plate to displacement of each hooking arm behind the peripheral edge of the aperture to overlap the peripheral edge whereby to longitudinally engage the catch plate – said configuration comprising an operative disposition.

A latch-bolt or latch bolt is an outwardly biased bolt capable of executing (or participating in) latching (and includes both rectilinearly displaceable and angularly displaceable bolts) and includes bolts having a leading end that is chamfered or otherwise profiled on one side to facilitate latching and includes advanced latch bolts (both pivotal and rectilinear) that are restrained in a pre-latching configuration prior to latching to either facilitate or assist latching and that in some forms are accompanied by an auxiliary bolt – advanced latch bolts in some forms comprising a prism shaped bolt that in some forms include counter-acting hooks and in some forms includes a leading end that is chamfered, curved or otherwise profiled on both sides to assist or facilitate latching.

An auxiliary bolt means an outwardly biased plunger that is operably associated with the advanced latch bolt

Unlatching means withdrawal of the latch bolt from engagement with the engageable means, i.e. withdrawal from the operative to the inoperative configuration, (for hinged door it commonly means withdrawal of the bolt from the aperture of the strike plate)

An unlatching lever is a lever or knob that is hand operable to cause the latch bolt to become unlatched

Locking means configuring the lock to restrain it from being unlatched and in some forms of locks employing deadlocking slides, it means restraining the deadlocking slide to restrain the bolt from being inwardly displaced by the unlatching lever

Deadlocking means to configure the lock to restrain the bolt from being displaced from the operative configuration (in the case of a rectilinearly displaceable bolt for a hinged door, it commonly means restraining the bolt in a fully extended position), the deadlocking means is some forms includes a deadlocking slide that is displaceable to cooperate with the bolt to restrain it against displacement;

deadlocked means the bolt cannot be displaced from the operative configuration by external forces

Deadlatching means the bolt is automatically deadlocked during latching; remote lock means a locking means disposed from the lock that includes a remote engaging member that is operably connected to the lock (often there is an upper and a lower remote bolt situated above and below the lock)

French Door means a door comprising a frame with a glass in-fill and often configured in pairs, a second door that is normally closed and is secured by vertical bolts and a first door that has the lock body and operable levers, often they have a strip of compressible sealing material located on the edge against which the first door closes to prevent energy loss, many French Doors comprise a hollow frame where the hollow within the frame is comparatively small in depth

Security Doors means a door comprising a hollow framed door with an in-fill of mesh or woven stainless steel where the hollow within the frame is comparatively small in depth and in width

Lock body is the lock portion fitted within the hollow frame of the wing, the lock body together with a strike plate, a pair of handle sets and a cylinder comprising a typical mortice lock; depth of lock body is the extent of the lock body in a direction parallel to the face of the door; width of lock body is the extent of the lock body in a direction at right-angles to the face of the door

Single cylinder is a cylinder comprising a key operable barrel within a cylinder housing (in one form and commonly it comprises a barrel operably connected to a first cam having a radially protruding arm)

Double-cylinder comprises opposed barrels each operably connected to the same first cam; clutched-double-cylinder comprises a cylinder having opposed barrels each connectable without free movement to the same first cam such that the cam can be angularly displaced by a barrel while the other barrel remain undisplaced, the cylinder includes a clutch to select which barrel is the operative barrel, the clutch being operated after key insertion

Free rotation single cylinder is a cylinder comprising a key operable barrel within a cylinder housing operably connected with free movement to a first cam to enable the cam to be displaced by barrel to a locking configuration and then the barrel to be reverse rotated to an undisplaced position enabling key removal; free rotation-double-cylinder comprises opposed barrels each connected with free movement to the same first cam such that the cam is free (between limits) to be angularly displaced while the barrels remain undisplaced, this type of cylinder being commonly used in security door locks in Australia to enable the cam to be displaced by either barrel to a locking configuration and then the barrel to be reverse rotated to an undisplaced position enabling key removal while leaving the first cam in the

locking position, (this type of cylinder being distinct from the double cylinders that employ clutches)

In some forms of both clutched and free rotation cylinders, one barrel is replaced by a hand operable turn knob; some single cylinder comprise a subassembly including a housing while in others, the housing comprises part of the handle backplate; some double cylinders comprise a subassembly including a housing while in others, the double cylinder housing comprises portions of the handle backplate.

A pivotal lock is defined herein as a lock having an angularly displaceable bolt herein called a pivotal bolt

A rectilinear lock is defined herein as a lock having a rectilinearly displaceable bolt herein called a rectilinear bolt.

Description of the Figures

Embodiments of the present invention will now be described by way of example only with reference to the accompanying drawings in which:

Fig 1 is an isometric view of a wing with a lock supported adjacent an opening,

Fig 2 is an isometric view of handle assemblies and a lock body.

Fig 3 is a schematic side view of a lock body with the lid removed and placed beside the lock body, the bolt fully extended, the unlatching cam at the "undisplaced orientation" with the deadlocking slide upwardly displaced by the cylinder screw to be in the "undisplaced position",

Fig 4 is the lock of Fig 3 with the deadlocking slide upwardly displaced to deadlock the bolt and to be in the "second locked configuration",

Fig 5 is the lock of Fig 3 with the deadlocking slide further upwardly displaced to deadlock the bolt and to be in the "first locked configuration",

Fig 6 is the lock of Fig 5 when viewed from the other side

Fig 7 is the lock of Fig 1 with the deadlocking slide in the "undisplaced position" and the bolt displaced to the retracted position by the unlatching cam,

Fig 8 is the lock of Fig 1 with the deadlocking slide in the "undisplaced position" and the bolt in the "pre-latching configuration"

Fig 9 is the lock of Fig 1, with the bolt fully extended, the deadlocking slide in the "undisplaced position" position, the driver annulus fully displaced,

Fig 10 is an isometric exploded view of the lock of Fig 1 from one side

Fig 11 is an isometric exploded view of the lock of Fig 1 from the other side,

Fig 12 is the lock of Fig 1, but adapted to provide exterior lever locking and including an egress deadlocking slide and an egress locking cam – the lock being shown in the "third locked configuration",

Fig 13 is an isometric view showing the lock body and underside of the exterior handle assembly,

Fig 14 is the lock of Fig 1, adapted to include a common deadlocking slide and a deadlatching locking cam,

Fig 15 is the lock of Fig 1, adapted to include a deadlatching deadlocking slide to be key operable

Fig 16 is the lock of Fig 1 adapted to be key operable to actuate remote locks

Fig 17 is the lock of Fig 16 without a bolt or unlatching levers and including a locking plunger,

Fig 18 is an isometric view of a chamfered prism like bolt,

Fig 19 is an isometric view of a drive bolt – amended 31/5/04

Fig 20 is an isometric view of a chamfered bolt,

Fig 21 is an isometric view of a retracted prism like bolt with hooking arms,

Fig 22 is an isometric view of an extended prism like bolt with hooking arms,

Fig 23 is a plan view of the bolt of Fig 22

Fig 24 is a schematic side view of a lock where the elongated drive members comprise Bowden Cables.

Fig 25 is an isometric view of an improved strike plate.

Fig 26 is the lock of Fig 1 with the deadlocking slide in the "undisplaced position" and the bolt is in either of two different "pre-latching configuration"

Fig 27 shows a pivotal bolt,

Fig 28 pivotal strike plate 42

Fig 29 pivotal bolt lock in pre latching configuration.

Description of the Figures raised @ 5/4/04

Fig 30 is an isometric view of a handle set when viewed from the underside configured as left handed and downwardly displaced to the maximum normal operating disposition,

Fig 31 is an isometric view of a handle set when viewed from the underside configured as left handed and upwardly displaced to the maximum normal operating disposition,

Fig 32 is an exploded view of Fig 30,

Fig 33 is the handle assembly of Fig 1 with the lever displaced 80 degrees to release the stronger spring,

Fig 34 is the handle set of Fig 30 configured as right handed.

Throughout this specification and claims which follow, unless the context requires otherwise, the word "locks" or variations such as "lock" will be understood to imply the inclusion of complete locks for displaceable wings and improvements for locks for displaceable wings that are transportable into other locks and locking devices without being limited to the inclusion in the complete locks described herein.

The inventions described herein relate to pivotal and rectilinear locks for displaceable **wings 1** supported adjacent an **opening 2.** One such wing is shown in Fig 1, where the wing has a **closing edge 3** that in the closed position of the wing, is adjacent an **element 4** that helps defines the extent of the opening and the lock is mounted relative to this closing edge.

Locks configured as mortise locks, include a **lock body 5** that is mounted within the door, the lock body including a substantially rectangular lamina-like **front plate 6** and an **engaging member 7** that is displaceable to engage with an **engageable means 8** mounted relative to the element.

Where the wing comprises a conventional hinged door, the closing edge of a closed door is adjacent a **door-jamb 9** and the engageable means comprises a **strike plate 10.** Where the wing comprises a conventional sliding door (not shown), the engageable means comprises a catch plate.

Locks described herein include; locks that are lockable by the cylinder and/or interior locking lever; deadlatching locks that automatically deadlock on latching; and locks where the exterior lever is unlockable by operation of the interior unlatching lever. These locks employ many common components and can be said to comprise as a lock series.

Some locks, and as shown in Fig 2 and 3, include a **front plate 12,** a **casing 13** having substantially rectangular lamina-like **sides 14** attached to internal **fixed portions 15** by substantially cylindrical **rivets 16** that have passage through **apertures 17** in the casing sides; some of these rivets comprising an extension of a fixed portion that passes through an aperture of a side to protrude from the external sides where it is peened over to prevent its withdrawal, or alternatively comprising a metal rivet having a head and a shank portion that passes through one side of the casing, then through an aperture in a fixed portion to then pass through the other side to be peened over on the external side of the other casing side.

The front plate is preferably attached to the casing by **screws 18** that have passage through **screw apertures 19** in the front plate to engage in **screw recesses 20** in the fixed portions, as shown in Fig 19. The front plate in some locks provides an

upper and lower fixing tab by extending upwardly from the top of the casing and downwardly from the bottom of the casing, these tab portions having a screw aperture to provide means of attaching the lock body to the wing as shown in Fig 19. In other cases, as shown in Fig 2, the front plate only covers a part of the front edge of the casing to leave screw apertures exposed at the upper and lower ends of the casing front edge – these apertures being employed to attach the lock body into the wing.

In some locks (not shown), a substantially rectangular **spacer 21** is between the front plate and casing to separate them to provide a lock of increased backset distance. In other locks (not shown), the front plate, the internal fixed portions and casing (except for one side) comprise a single member such as a single casting having tab portions that extend upwardly from the top of the casing and downwardly from the bottom of the casing, each tab having a screw aperture to provide means of attaching the lock body to the wing.

rectilinear bolt

The **rectilinear bolt 22**, as shown in Fig 6, comprises a **first bolt portion 23** that has passage through a rectangular **bolt aperture 11** in the front plate and a **return bolt portion 24** within the casing. The rectilinear bolt includes a longitudinally elongated **support recess 25** having an **opening 26** on the inside end of the bolt. Supported by the **rear casing wall 27,** is a **T member 28** comprising a vertical **plate 29** that is supported in a **slotted aperture 30** of the rear wall 27 and an orthogonal forward projecting **guide pin 31** (that in some locks is cylindrical) that protrudes into the support recess to (with the bolt support recess) comprise a telescopic joint so that the guide pin is able to support the bolt over its working range of dispositions - the bolt also being supported by the periphery of front plate bolt aperture and the sides of the casing.

pivotal bolt

Some locks alternatively include a **pivotal bolt 32**, as shown in Fig 27 and 29, comprising an angularly displaceable member that is displaceable about a **bolt shaft 33** that comprises a **metal rivet 34** that extends through both sides of the casing and through a **bolt aperture 35** in the bolt to support the bolt. The pivotal bolt includes a **first pivotal bolt portion 36** that is displaceable so that a portion of it protrudes from the casing and **return pivotal bolt portion 37** angularly disposed from the first pivotal bolt portion relative to the pivotal axis of the pivotal bolt.

Some pivotal bolts, as shown in Fig 27, comprise a segment of a substantially solid parallel-sided cylindrical disc defined in part by an **outer radius R** referenced from the bolt pivotal axis and having a general thickness T and bounded by two

spaced edges including a **leading edge 38**. Within at least one side of the bolt, between the pivotal axis and outer edge, extending from the leading edge is a **side recess 39** defined by an outer **recess radius r** that does not extend to the outer edge and so leaving a sideways **relatively protruding shoulder 40** ("relatively" meaning that the shoulder may be within the general thickness but in relation to the adjacent side recess it comprises a sideways protruding shoulder) comprising an **arcular shoulder 41**. Accordingly, the side recess 39 is planar at a relative **depth of t** and defined by a normal vector that is parallel to the pivotal axis of the bolt and the relatively protruding shoulder has a **radial width of R-r** and a relative height of t and the thickness of the bolt through the recess (or through the recesses) (herein called the **web thickness**) is equal to **T-t.** When each side of the bolt is profiled as described above, the width of the bolt between side recesses is **T – 2t.**

Although preferable that the outer edge of the bolt have a constant radius R, and the side recess be defined by a constant radius these configurations are not essential to the pivotal bolt. However, this form provides the advantage that the strike plate, once aligned to enable the bolt to enter the entry aperture (defined below) will provide free passage to the bolt over its full range of displacement. Even if the bolt is displaced relative to the strike plate when in the fully extended position, it can be displaced to withdraw from the strike plate aperture without having to deform the strike plate. If the bolt is urged against the strike plate it can be displaced (by overcoming frictional forces) to withdraw from the strike plate aperture and again without having to deform the strike plate.

pivotal strike plate

A **pivotal strike plate 42** for this pivotal bolt as shown in Fig 28, comprises a substantially conventional strike plate having a **wing 43** to facilitate latching, an **aperture 44** to provide passage for the bolt. The pivotal strike plate 42 has an aperture **peripheral edge 45,** and upper and lower **attachable portions 46** that include **screw apertures 47** to enable the pivotal strike plate to be attached to the element helping to define the opening. The aperture 44 includes a rectangular **entry aperture 48** having a substantially conventional width (T plus working clearances) to allow entry of the arcular shoulder 41 with a little clearance and a lower rectangular **offset recess 49** connected to the entry aperture and of reduced width to allow entry of just the web of the bolt with a little clearance and not permitting rectilinear passage of the arcular shoulder through this aperture. The width of this offset recess is less than T but greater than T – t or T-2t, depending on whether the bolt has one or two side recesses. The bolt and pivotal strike plate dimensions are configured such that during latching each arcular shoulder enters the entry aperture and the web enters

the offset recess. When this bolt is in the operative fully extended position and engaged with the pivotal strike plate a portion of each annular shoulder overlaps a **peripheral edge 50** of the offset recess to a) provide longitudinal engagement whereby to restrain the bolt from being horizontally displaced from the pivotal strike plate in a direction parallel the face of the wing, and b) to provide lateral engagement whereby to restrain the bolt from being horizontally displaced from the pivotal strike plate in a direction orthogonal to the face of the wing. When this bolt is in the operative fully extended position and engaged with the pivotal strike plate each annular shoulder vertically overlaps a peripheal edge of the offset recess by a distance that is a function of the gap between the front plate and pivotal strike plate wherein, the further apart they are the less is the operlap. The bolt and pivotal strike plate aperture are configured to maximize the overlap for a door having the largest gap one would expect in a well fitted door while observing other design considerations such as minimum acceptable component strength. By referencing the figures, it will be appreciated that the larger is r, the larger can be the overlap; and the larger is r the weaker will be the arcular shoulder that has a radial width of R-r. In the preferred pivotal bolt, r is maximized but not so as to undesireably weaken the arcular shoulder.

Because wings sometimes drop after fitting and because of wing installation errors it is preferable that the pivotal bolt and pivotal strike plate properly engage within a range of vertical relative disposition and in practice it has been found necessary for this range to extend from –4MM to +4MM about a nominal central position. Within this range of relative dispositions, the bolt must be able to enter and withdraw from the aperture and to overlap the offset aperture as described above and so the bolt and pivotal strike plate are further configured to function correctly and to have maximum overlap within the range from 4MM below the nominal central position to 4MM above while observing other considerations. The improved pivotal catch plate 42 observing the above requirements is subject to two extreme configurations A and B described below and these help define the form.

'A) The gap being zero and the pivotal strike plate being relatively disposed at – 4MM from the central position and where the upper edge of the entry aperture is horizontally aligned with the upper edge of the bolt.

'B) The gap being maximum (in practice proved to be 6 MM), the pivotal strike plate being relatively disposed at + 4MM from the central position, and where the upper edge of the offset aperture is in contact with the inner wall (defined by r) of the arcular shoulder. For practical reasons, the aperture is further configured so as to suit

both left hand and right hand hinged wings and also includes an upwardly extending second offset recess 51 that is used when the pivotal strike plate is inverted.

Although the description above refers mainly to a lock for hinged wings, the material is relevant to a lock for sliding wings that has a catch plate with an aperture as described above - the catch plate comprising the pivotal strike plate described above without the wing 43. In some locks the catch plate is displaced from the element defining the opening to provide clearance for the bolt to fit between the element and underside of the catch plate.

advanced latch bolts

The locks within the invention (excluding the deadlatching type) electively include any one of the bolts within the definitions above, including pivotal bolts, rectilinear bolts, and pivotal and rectilinear advanced latch bolts characterized by a pre-latching configuration in which the latch bolt is disposed from the operative configuration and that during latching are enabled to be displaced to the operative configuration (and the deadlatching locks herein all employ advanced latch bolts) . Fig 8 and Fig 29, show locks in this pre-latching configuration that on latching are displaced to the operative configuration comprising an extended position where the latch bolt protrudes from the casing. In some advanced latch bolts for sliding doors, the engaging arm first portion is always substantially within the casing and the operative configuration comprises a portion of the engageable means protruding into the casing to be engaged with the engaging arm. The advanced latch bolts as defined herein, are accompanied by an outwardly biased displaceable auxiliary bolt that when extended acts to restrain the advanced latch bolt from being displaced from the pre-latching configuration towards the operative configuration.

auxiliary bolt

Some rectilinear locks, as shown in Fig 8, include an **auxiliary bolt 52** configured to suit advanced rectilinear latch bolts and that comprise a **first auxiliary bolt portion 53** that has passage through an **auxiliary bolt aperture 54** in the front plate and a substantially rectangular **return auxiliary bolt portion 55** that is within the casing and by which it is supported. Some return auxiliary bolt portions have a blade-like rearwardly extending portion for better support. The auxiliary bolt is outwardly biased by a **compression spring 56**, as shown in Fig 3, that acts between the outer end of an open-sided **spring recess 57** within the return auxiliary bolt portion and a **vertical wall 58** of a casing fixed portion.

The return auxiliary bolt portion, as shown in Fig 8 and 26, has a sideways protruding **side pin 59** that engages with a **profiled side recess 60** of an adjacently positioned and substantially lamina **control rocker 61** that is located within the

casing between a side wall of the casing and the return auxiliary bolt portion. The control rocker being supported by a **rocker pivotal joint 62** located beneath the advanced latch bolt and auxiliary bolt and adjacent to the front plate and forward of the side pin 59. The rocker pivotal joint 62 defines a pivotal axis orthogonal to a side of the casing. The control rocker extends vertically and rearwardly from its pivotal axis to terminate in a **free end portion 63** that has a **control shoulder 64** that is engageable with the latch bolt (to restrain the bolt) when the latch bolt is in the pre-latching configuration shown in Fig 8. The control rocker profiled side recess includes an inwardly and upwardly **ramped edge 65** that lies in the same vertical plane as the side pin 59. The parts are configured such that as the auxiliary bolt is inwardly displaced, the side pin 59 slides along the ramped edge 65 of the control rocker to cause the control rocker to displace away from the latch bolt to cause the control shoulder 64 to be displaced away from a **bolt edge recess 66** of the rectilinear advanced latch bolt to a position where it cannot be engaged by the latch bolt. The lower edge recess 66 comprises a recess in the under-edge of the bolt. In some bolts it comprises a **slot 67** extending outwardly from a **slot end 68.** In some locks when the lock is in the pre-latching configuration, the surface of the slot end 68 contacted by the control shoulder 64 is preferably defined by a vector normal to the surface of the slot end that intersects the control rocker pivotal axis - this geometry being characterised by the control shoulder being able to slide on the surface of the slot end without causing the latch bolt to displace and, an outwards force on the latch bolt not giving rise to a moment on the control rocker.

The profiled side recess of the control rocker 60 also includes a substantially vertical **forward shoulder 69** that lies in the same vertical plane as the side pin 59 and in front of the side pin 59 and that extends upwardly from the rocker pivotal joint 62. The parts are configured such that during outwards displacement (from the retracted position) of the auxiliary bolt, the side pin 59 engages the inside edge of the forward shoulder 69 to pivot the control rocker outwardly to cause the control shoulder to displace upwardly towards the bolt towards engagement with the rectilinear advanced latch bolt. Within the side recess of some control rockers, as shown in Fig 8, there is a substantially **elongation 70** that is horizontal when the latch is disengaged to enable the auxiliary bolt to be inwardly displaced without substantially displacing the control rocker. In some locks as shown in Fig 26, the front plate can be removed to enable the control rocker to be removed from the casing to be replaced by another whereby to change the distance the auxiliary bolt and/or latch bolt protrude from the front plate in the pre-latching configuration. In locks having this adaptability, the pivotal joint comprises a horizontal **rocker pin 71**

that is supported within a **U shaped pocket 72** of a fixed casing portion with the opening to the pocket abutting the front plate so that removal of the front plate provides accessibility to the pocket.

In normal usage, the latch bolt is displaced to the retracted position by operation of an unlatching lever (described below) and as shown in Fig 2, then the wing is opened and as this occurs, the auxiliary bolt 52 outwardly displaces to a position where the side pin 59 is restrained by the forward shoulder 69 of the control rocker 61 itself restrained by the control shoulder 64 abutting the underside of the latch bolt, as the unlatching lever is then allowed to reverse towards the undisplaced position, the latch bolt outwardly displaces till the bolt edge recess 66 presents itself to the control shoulders which then enters the bolt edge recess to restrain the latch bolt in the pre-latching configuration.

Some rectilinear locks, as shown in Fig 3, employs the auxiliary bolt 52 described above and the pivotal lock shown in Fig 29 employs a pivotal auxiliary bolt described below, in both cases the first auxiliary bolt portion preferably has a **leading end 73** profiled on both sides, as shown in Fig 2, to accommodate both left hand and right hand doors wherein the profiled portion on each side is curved, chamfer or otherwise profiled to facilitate latching wherein the pivotal auxiliary bolt is engageable on either side by a strike plate to be inwardly displaced by the strike plate during latching.

pivotal auxiliary bolt

Some pivotal locks, as shown in Fig 29, include an auxiliary bolt configured as a **pivotal auxiliary bolt 74** to suit advanced pivotal latch bolt and that comprise a **first pivotal auxiliary bolt portion 76** similar to that described above that has passage through an **auxiliary bolt aperture 75** in the front plate, and a **return pivotal auxiliary bolt portion 77** within the casing by which it is supported and comprising a full width **shoulder portion 78** connected to a **flat arm 79** that extends along the inside of a side wall of the casing to terminate in a flat washer-like **washer portion 80** having a **washer aperture 81** though which the bolt shaft 33 has passage to provide a pivotal axis for the pivotal auxiliary bolt and it is outwardly biased by the **compression spring 82** supported between the shoulder portion 78 and a **vertical wall 83** of a casing fixed portion. The pivotal auxiliary bolt has a sideways protruding **side pin 84** (similar to 59 and preferably both 59 and 84 are cylindrical in form) that extends outwardly from the shoulder portion 78 to be within an angled **control slide aperture 85** of an adjacent displaceable **control slide 86** (similar to that described in prov of October 15, 03) that extends vertically along a side wall between the shoulder portion 78 and the side wall. The control slide

aperture 85 includes an upwardly and inwardly **ramped slot 86** that is defined in part by an upwardly and inwardly sloped **lower slot edge 87** that lies in the same vertical plane as the control pin. The parts are configured such that as the auxiliary bolt is inwardly displaced the control pin 82 slides along the lower slot edge 86 to displace the control slide 84 away from the bolt to displace a **pivotal control shoulder 88** of the control slide away from the bolt to affect the latch bolt as described for the rectilinear bolt. The control shoulder 88 is engageable in an **edge recess 89** in the return portion of the bolt that includes a substantially **vertical shoulder 90** to restrain the latch bolt in the pre-latching configuration. The ramped slot 85 is also defined in-part by an **upper slot edge 91** that lies in the same vertical plane as the side pin 82. The parts are configured such that as the pivotal auxiliary bolt is outwardly displaced the side pin 82 slides along the upper slot edge 89 to urge the control slide towards the latch bolt to displace the pivotal control shoulder 87 towards engagement with the pivotal latch bolt. In some forms of locks the ramped slot 85 is connected to a substantially **horizontally elongated portion 92** to enable the auxiliary bolt to be inwardly displaced without substantially displacing the control rocker to accommodate additional displacement of the pivotal auxiliary bolt.

In normal usage the pivotal latch bolt is displaced to the retracted position by operation of an unlatching lever (described below) and as shown in Fig 2, then the wing is opened and as this occurs the pivotal auxiliary bolt displaces outwardly to a position where the side pin 82 is restrained by the upper slot edge 89 of the control slide 84 itself restrained by the pivotal control shoulder 87 abutting the underside of the return portion of the pivotal latch bolt, and as the unlatching lever is then allowed to reverse towards the undisplaced position, the latch bolt outwardly displaces till the bolt edge recess 88 presents itself to the pivotal control shoulder 87 which then enters the bolt edge recess 88 to restrain the return portion of the pivotal latch bolt from displacing inwardly from its pre-latching configuration whereby to restrain the first pivotal bolt portion from displacing outwardly.

unlatching rocker

Some rectilinear locks incuding those having latch bolt, as shown in Fig 4, include an **unlatching rocker 93** that is angularly displaceable about a **pivotal joint 94** having a pivotal axis that is orthogonal to the sides of the casing and located between the latch bolt the unlatching cam/s described below. The pivotal joint 94 comprises a **rocker shaft 95** that passes through an aperture in the unlatching rocker, the rocker shaft comprising a pinned extension of the casing or alternatively a metal **rivet 96** that passes through both sides of the casing to both support the rocker relative to the sides and help retain the casing sides. The unlatching rocker 91 has a

first rocker arm 97 extending upwardly from the pivotal joint to terminate in an **engageable shoulder 98** and a **second rocker arm 99** extending downwardly to overlap the return bolt portion to enable a sideways protruding **drive pin 100** of the second arm to locate in a **bolt drive recess 101** in a side of the rectilinear latch bolt.

pivotal unlatching rocker

Some pivotal locks including those having latch bolt, as shown in Fig 29, include an unlatching rocker configured as a **pivotal unlatching rocker 102** that is similar to that employed in the rectilinear locks described above having s first unlatching rocker arm 109 and a **second unlatching rocker arm 103 that** extends downwardly to overlap the first bolt portion to facilitate operable coupling through a sideways protruding **drive pin 104** of the second arm that locates in a **pivotal bolt drive recess 105** in a side of the bolt so that the latch bolt is angular displaceable towards the retracted position by inwards displacement of the drive pin 104.

As shown in Fig 3, the pivotal and rectilinear locks within this invention that have latch bolts include means to outwardly bias their respective latch bolts comprising a **bolt torsion spring 106** supported around the unlatching rocker shaft that has a **free end 107** that acts on the second arm of the unlatching rocker to outwardly bias it and a **fixed end 108** restrained by the casing and the substantially cylindrical body of the torsion spring is supported about the shaft. Alternatively, some locks include a compression between the bolt and rear casing wall that acts directly on the bolt but to minimize the components types within the lock series it is preferable that all locks employ the torsion spring that acts on the unlatching rocker.

Unlatching cam

The pivotal and rectilinear locks within the invention include operating means by which to displace the latch bolt towards the retracted position including an **unlatching cam 110,** as shown in Fig 5, that is connected to a hand operable **unlatching lever 111** as shown in Fig 2. The unlatching cam has a downwardly extending **unlatching arm 112** that (towards its free end) has a **driving shoulder 113** that is rearward of the rocker first arm and within the same plane such that that forward displacement of the driving shoulder (by downwards unlatching lever displacement) causes the first rocker arm to displace in a forward direction to cause the second rocker arm to rearwardly displace to cause the bolt to displace towards the retracted position. Each unlatching cam is supported by at least one sideways protruding **cylindrical portion 114** that extends into a **circular aperture 115** in a side of the casing. This cylindrical portion also includes a portion of the unlatching cam drive aperture.

In some locks, as shown in Fig 2, not including egress locks, the unlatching cam and a pair of levers, an **exterior unlatching lever 116** and an **interior unlatching lever 117,** are connected by a single **shaft 118** that has passage through a **drive aperture 119** in the unlatching cam to mate within **drive recesses 120** in each unlatching lever.

deadlocking slide

Some pivotal and rectilinear locks include a **deadlocking slide 121,** as shown in Fig 5, (that takes a number of forms) that is displaceable to and from a deadlocking configuration in which the bolt and deadlocking slide cooperate to restrain the bolt from being displaced to the retracted position- the deadlocking slide includes an end portion that is co -operable with the bolt to restrain the bolt from being displaced. When participating in the deadlocking configuration, the deadlocking slide can be said to be in a deadlocking position. [Within the scope of this invention the deadlocking position comprises a limited range of deadlocking slide positions over which the bolt and deadlocking slide so cooperate and the invention embraces the bolt being within a limited range of operative positions over which the bolt and deadlocking slide cooperate and from which the bolt is restrained against displacing].

In the deadlocking slides of the various different rectilinear locks, the **leading end 122** has an **engaging shoulder 123** that is engageable behind an **engageable shoulder 124** of the rectilinear latch bolt to restrain it against inwards displacement - the engaging shoulder 120 being in the same vertical plane as the engageable shoulder 121, a plane that is parallel a casing side.

In the deadlocking slides of the various different pivotal locks, the leading end 119, as shown in Figs 28, has a **leading shoulder 125** that is displaceable to a position in front of a **return shoulder 126** of the pivotal bolt return portion 37 to restrain that portion from outwardly displacing whereby to restrain the first bolt portion from inwardly displacing. The leading shoulder 124 is defined in-part by a change in the width of the bolt, the shoulders laying in the same vertical plane parallel to a casing side. [The invention embraces the pivotal bolt being within a limited range of angular positions over which the bolt and deadlocking slide so cooperate and from which the pivotal bolt is restrained against displacing].

As shown in Fig 5, the deadlocking slide 118 is supported by a sideways protruding **guide pin 127** that is within a vertically elongated **guide slot 128** of a casing side and in some locks it is alternatively or as well as, supported by a rearwardly extending deadlocking slide **foot 129** that abuts the inside face of the casing rear wall and in operation to slide along the inside face of this wall.

The various locks types (pivotal and rectilinerar) employing a cylinder include means for the cylinder to displace the deadlocking slide to and from the deadlocking configuration and where the cylinder comprises a substantially conventional cylinder assembly having a **cylinder cam 130** with a protruding **cylinder cam arm 131** the deadlocking slide includes a drive recess to accept and mesh with the cylinder cam arm.

In some forms, the deadlocking slide supports a torsion **slide spring 132** to bias the cylinder cam (or first cam arm described below) against leaving the drive recess. The slide spring is supported in a **cylindrical recess 133** in a side of the deadlocking slide recess below the drive recess as shown in Fig 5, the spring having a **free arm 134** that extends rearwardly to intersect the locus of movement of the end cylinder cam arm (or first cam arm) and a **fixed end 135** restrained within the deadlocking slide. The spring arm preferably lies in the same plane as a central plain of the lock body and first cam. Parts are configured such that the cylinder cam arm (or first cam arm) cannot leave the drive recess during normal operation without displacing the slide spring arm against biasing force and when the lock is in a first locked configuration, the cylinder cam arm (or first cam arm) and slide spring arm are substantially orthogonally disposed as shown in Fig 5.

Some locks, (not including deadlatching and egress locks) include a deadlocking slide having an **adapted leading end 136** that includes a ramped or otherwise profiled shoulder that extends inwardly while extending upwardly. This being configured such that as the deadlocking slide is displaced towards the deadlocking position, the ramp engages with the lower rear corner of the engageable shoulder 121 of the bolt to urge and displace the bolt outwardly – the action taking place by dint of the ramp sliding over the corner to exert a force having an outwards component. In these locks the deadlocking configuration corresponds to a fully extended bolt.

locking member

Some pivotal and rectilinear locks include a locking member that comprises an interior rectilinearly displaceable hand operable member (not shown) supported relative to the interior handle assembly that has passage through an aperture in a side of the wing to be connected to the deadlocking slide.

In other pivotal and rectilinear locks, as shown in Fig 2, the locking member comprises a hand operable angularly displaceable **locking lever 138** (commonly called a snib lever) that is connected by a **spindle 139,** as shown in Fig 13, (that has passage through an aperture in a side of the wing) to an angularly displaceable **locking cam 140** within the casing as shown in Fig 7. The locking cam is supported

by **cylindrical portions 141** that extend into **circular apertures 142** in the sides of the casing. The locking cam has a **spindle aperture 143** to accept and mate with the spindle. The locking cam includes a **locking cam arm 144** having a displaceable **free end portion 145** that overlaps a portion of the deadlocking slide to couple the deadlocking slide and locking cam.

In some forms, the free end portion has a sideways **protruding pin 146** within a substantially **horizontal slot 147** within the deadlocking slide to couple the deadlocking slide in a slide follower relationship.

In each case the locking cam is displaceable to displace the deadlocking slide to and from the deadlocking configuration when it is not locked by the cylinder to a first locked configuration.

first cam

Some pivotal and rectilinear locks, as shown in Fig 6, include an angularly displaceable **first cam 148** to displace the deadlocking slide to and from the deadlocking configuration. The first cam in some forms is independently supported in the casing and in other forms the first cam comprises the cylinder cam 130 of a conventional cylinder assembly and accordingly, the first cam arm comprises the cylinder cam arm.

The first cam arm has a radially protruding **first cam arm 149** defined in part by an **end face 150** that comprises an arcular portion of constant radius and a **first cam pivotal axis,** as shown in Fig 6. The first cam arm acts on a substantially horizontal **upper drive face 152** of the **drive recess 153** of the deadlocking slide to displace the deadlocking slide towards the deadlocking and acts on a substantially horizontal **lower drive face 154** to displace the deadlocking slide from the deadlocking configuration. To provide a **first locked configuration,** the drive recess includes an **exit shoulder 155** that in one forms comprises an angled face connected to the upper drive face 145 disposed such that when the lock is in the first locked configuration, as shown in Fig 5, the first cam end face 148 abuts the exit shoulder so that the force applied to the first cam by the deadlocking slide when an attempt is made to move the deadlocking slide from the deadlocking configuration (as might occur in an attempt to rotate the snib lever), has a direction that passes through the pivotal axis 144 of the first cam without giving rise to a moment to cause the first cam to rotate; and additionally, the first cam in this configuration restrains the deadlocking slide from displacing from the deadlocking configuration. The lock can only be configured to and from the first locked mode by actuation of the first cam.

Locks can also be configured into and out of a **second locked mode or configuration,** as shown in Fig 4, characterized by the first cam arm being within the

drive recess and the deadlocking slide being in a deadlocking configuration. The lock is configurable to the second locked configuration by actuation of the interior locking lever and by actuation of the first cam.

Where a **cylinder screw 156,** as shown in Fig 3 is employed to restrain a separate lock cylinder (also called a cylinder) relative to the casing, the screw has passage through the casing to be engaged in a **threaded aperture 157** in the cylinder, and in these forms the screw also preferably performs the function of restraining the first cam arm against leaving the drive recess by displacing in a direction away from the bolt; the screw does this by restricting the downward displacement of the deadlocking slide from what is defined herein as the undisplaced position of Fig 3 where the first cam arm is captured within the drive recess. In usage, after the cylinder has been inserted in the cylinder aperture in the lock body, the first cam arm 142 is rotated to be within the drive recess 146 at which time the cylinder screw is inserted to displace the deadlocking slide away from the initial position and to the undisplaced position.

In some pivotal and rectilinear locks, (not shown) the first cam is supported in apertures within the side walls of the casing to be operably connected on one side to a key operable cylinder having an angularly displaceable barrel, the cylinder having a housing supported in or comprising a portion of the back-plate of a lever assembly. In some lock, there is a pair of opposed cylinders as described above. In each case the barrel has an inwardly projecting extension that engages in a side recess of the first cam with free movement. In some locks the barrel comprises a wafer supporting barrel and each barrel has a peripheral end side protrusion in line with the wafers and similar in form to an extended wafer. The housing has the normal longitudinally elongated cylindrical aperture bounded by opposed parallel longitudinally elongated wafer apertures that are preferably rectangular in form that open into the cylindrical aperture, the wafer recesses to facilitate wafers protruding from the barrel as is well known; however in the locks within one wafer aperture has an end wall and the other has an aperture to permit passage of the end side protrusion so that the barrel can be inserted and rotated to be unable to be removed. Preferably, the barrels and cylinder cam are coaxially supported and the portion of the barrel protruding from the cylindrical aperture includes an end extension to engage in a side recess in the first cam to operate the cam. Once assembled the barrel movement is restricted by its engagement with the first cam to dispositions where the protrusion does not become aligned with the aperture enabling barrel removal.

drive means

Some pivotal and rectilinear locks include a **drive member 158,** as shown in Fig 8 and 9, to operate at least one remote engaging member, the drive member being supported within the casing to be operably connected to each unlatching lever so that upwards displacement of an unlatching lever causes the driver member to displace to actuate each remote engaging member to an operative position that where the remote engaging member comprises a bolt, comprises an extended position where it protrudes from the wing. In some locks, upwards displacement causes the bolt to be driven to the operative position (if in the case of latch bolts, it has not been displaced there by the biasing means). Downwards lever displacement causes the driver member to actuate each remote engaging member from the operative position while causing the bolt to retract.

In some locks there is an upper engaging member (not shown) operably connected to the driver member by an elongated **upper drive member 159** and a lower engaging member (not shown) operably connected to the driver member by a **elongated lower drive member 160** as shown in Fig 5. The driver member in some locks is connected directly to one or both elongated drive members and in other locks the driver member is operably connected to one or both drive members by one or a pair of interspaced drive slides supported within the casing. In some locks there is a pair of counteracting drive slides (an upper and a lower) that is supported within the lock casing and which are connected to the driver member.

In one form, the driver member comprises an angularly displaceable **driver annulus 161** having a **base 162** and an annular **sidewall 163** defined in part by a **pivotal axis 164** orthogonal to the plane of a casing side. The driver annulus is preferably supported within [and in some forms by] a raised casing **annular wall 165** that completely or partly surrounds the drive annulus and in some forms, the driver annulus is supported by an axial cylindrical sideways protrusion of the base 161 comprising a **pin 166** that locates within a circular **aperture 151** in a side of the casing to comprise a pivotal joint.

Some pivotal and rectilinear locks, as shown in Fig 8, includes means of releaseably restraining the driver member in the fully displaced position and to restrain the driver member in the undisplaced position as shown in Fig 8, said means including a **recesses 167** within the side of the driver annulus 160 and a **ball 168** biased towards the annulus by **spring 169**, the spring and ball are located within a substantially **radially extended recess 170** within the driver annulus wall 164. When the driver annulus is in either the fully displaced or undisplaced position the ball is aligned with one of the recesses 167 and a moment has to be applied to the driver annulus 160 to displace the ball from the recess.

In some locks where: 1) the upper and lower elongated drive members are to be counteracting, and 2) the operative configuration is to correspond with outwardly displaced drive members, and 3) the operative configuration corresponds with upwardly lifted unlatching lever, a **first joint 171** of the driver annulus that is operably connected to the upper remote engaging member is rearwardly disposed of the driver annulus 160 pivotal axis and a **second joint 172** that is operably connected to the lower remote engaging member is forwardly disposed. The first and second pivotal joints in one form comprise pin joints (and herein the terms are used synonymously) comprising a pin extending sideways from one member to locate within the other member or a pin that extends from within apertures in each member to be relatively displaceable to at least one, importantly the first and second joints accommodate relative angular displacement. The term pin herein embraces a substantially right-angled return portion of a drive slide or drive member.

In other forms, (not shown) the joints comprise sideways protruding pins of the driver annulus that extend into substantially horizontal slots of the cooperating member.

In locks complying with the above requirements, and as shown in Fig 9, the driver annulus 160 is connected directly to the upper elongated drive member by the first joint 171 and it is operably connected by a second joint 172 to the lower elongated drive member by a **lower drive slide 173.** In some locks (not shown), the lower drive slide comprises a flat, plate-like vertically elongated member having a sideways protruding pin being part of the second joint that is supported within the casing adjacent a side (between a side and the bolt) and that extends from the bottom of the casing to provide a joint enabling connection to the lower elongated drive member. In some locks (and where there is insufficient space within the casing for the lower drive slide described above) the lower drive slide 173 is connected to the second joint by an intermediate mechanism described below.

In some locks, as shown in Fig 9, the driver and each unlatching cam are closely disposed (to require less space within the casing and for other reasons) and their respective pivotal axii are closely disposed. In some locks, the cylindrical portion of each unlatching cam that is supported in an aperture in a casing side is within an envelope substantially defined by the driver member. In some locks, each unlatching cam cylindrical portion is within the driver annulus side-wall. In some locks, (not shown) where the driver member pivotal axis intersects each unlatching cam, the driver annulus is without the pin 145, and the driver annulus 160 is supported by the annular wall164.

The driver side wall, as shown in Fig 9, includes a **locking shoulder 174** and an **unlocking shoulder 175** that are defined in-part by a **driver drive recess 176** between them and each unlatching cam includes a **drive arm 177** comprising (in an undisplaced disposition) a substantially horizontal radially extending blade-like arm that extends from the unlatching cam into the driver drive recess 176 to overlap the side wall 162. The locking shoulder 174 and unlocking shoulder 175 are angularly spaced such that when the driver member 160 is undisplaced and each unlatching lever 109 and 110 is undisplaced, each drive arm 177 abuts the locking shoulder 174 and when the unlatching levers are lifted to fully displace the driver member (to actuate remote engaging members to the operative position) the drive arm engages the locking shoulder to displace it downwardly, and when the unlatching levers 109 and 110 are then returned to the undisplaced position each drive arm 177 then abuts the unlocking shoulder 175. When the lock is unlatched by pushing the unlatching levers 109 and 110 downwardly, the drive arm 177 displaces the unlocking shoulder 175 upwardly to the undisplaced position to displace the remote engaging members from the operative position, during which displacement the unlatching rocker 91 is displaced to displace the latch bolt to the retracted position - a fully retracted latch bolt corresponding to an undisplaced driver member.

In the egress locks described below, where there is a pair of unlatching cams, either unlatching lever may be separately actuated as described above while the other unlatching cam and other unlatching lever remain undisplaced.

In some pivotal and rectilinear locks, the lower drive slide 173 is disposed rearwardly of the casing to comprise a vertically elongated, substantially rectilinearly displaceable drive slide as shown in Fig 9, and in some forms comprises a substantially cylindrical member. The second joint is connected by an angled **intermediate member 178** to the **free end 179** of an **intermediate rocker 180** by a **pin joint 181,** the intermediate rocker 180 extending from a **pivotal joint 182** shared with the casing and located adjacent the front plate to its **free end 183** disposed rearwardly of the casing. The free end also shares a **pin joint 184** with the rearwardly disposed **lower drive slide 173** that extends from the pin joint 184 towards the lower end of the casing. The intermediate rocker 180 and intermediate member each have a pivotal orthogonal to a side of the casing. The mechanism described is particularly relevant to locks where the latch bolt first portion is to have maximum width within the constraints of the casing width and where there is no space between the casing sides and the latch bolt for other components.

In normal usage, rotation of the driver annulus in a locking direction by lifting the free end of an unlatching lever drives the upper elongated drive member

upwardly and the lower drive slide downwardly by causing the intermediate member to pull the intermediate rocker downwardly. Preferably the upper drive member and lower drive slide displace simultaneously in opposite directions and in forms of the invention, the total displacement of each is identical (although at any intermediate position this may not be so) - the lengths of the intermediate member, the length of the intermediate rocker and the location of the joints being configured to provide such. Rotation of the driver member in a unlocking direction by lowering the free end of the unlatching levers and, drives the lower drive slide upwardly.

Where the bolt is to be outwardly displaced by actuation of either unlatching lever, the driver annulus 160 is further configured such that when the driver annulus is fully displaced in a locking direction, the bolt is in the operative configuration, as shown in Fig 9, and a **secondary driven shoulder 185** of the unlatching rocker 91 abuts a **secondary driving shoulder 186** of the driver annulus 160. When the driver is undisplaced as shown in Fig 3, the secondary driven shoulder of the unlatching rocker 91 is disposed from the secondary driving shoulder of the driver annulus so as not to affect its movement. When the latch bolt is restrained partly extended (as may occur as a result of malfunction) and the driver annulus 91 is subsequently driven to the fully displaced position, during this displacement, the secondary driven shoulder 185 is engaged by the secondary driving shoulder 186 to be driven to a configuration corresponding to a bolt in the operative configuration and to simultaneously displace the bolt to the operative configuration (that for a substantially conventional lock for a hinged door, comprises a fully extended position where it protrudes from the lock casing). This functionality is particularly applicable to doors having seals.

In some pivotal and rectilinear locks, as shown in Fig 6, the deadlocking slide 122 is connected to a vertically elongated blade like **driver locking slide 187** by a pin joint comprising an **aperture 188** in the slide and a protruding cylindrical **pin 189** of the deadlocking slide foot 140. The driver locking slide disposed from the aperture 188 has a **stop shoulder 190** that is displaceable into a circumferential **driver locking recess 191** of the driver annulus 160 to restrain it from being displaced from the fully displaced position. In some locks, there is also a circumferential **subsidiary locking recess 192** of the driver annulus that is utilized to restrain it from being displaced from the undisplaced position.

In should be understood that the locking provided by the driver locking slide is additional to the locking provided by the deadlocking slide cooperating with the bolt as described above.

In forms of the invention, the first and second joints, as shown in Fig 8 and 9, are equidistance (by a radius r) from the driver annulus pivotal axis and on

substantially opposite sides of the pivotal axis and the first joint and the annular driver pivotal axis are in the same horizontal plane when the driver is angularly disposed half way between the undisplaced and fully displaced positions. The lower drive slide 173 extends vertically downwardly within a **casing channel 200** along the inside rear casing wall of the casing to leave the channel whereupon to have a **dog leg portion 201** and extend to a **tail portion 202** having a longitudinal axis that is substantially midway between the casing sides. The tail supports a substantially cylindrical **fitting 203**, shown in Fig 17, having a **slot 204** in a **head 205** of larger diameter, the cylindrical portion being externally **threading 206** that it can receive and mate with an internally **threaded end 207** of the lower drive member. The fitting has a longitudinally elongated **aperture 208** and a lower end **cone portion 209** through which the tail passes to be crimped to retain the fitting on the tail. The slot 196 receives the orthogonal portion of the dog leg to restrain the fitting against rotation as the tube is wound on.

In forms of the invention, the cone portion or adjacent to the crimped portion is connected to a flexible elongated **cord 210** that extends along the inside of the lower drive member comprising a tube. During fitting, after the lock body is within the doorframe, the cord 202 is pulled tightly and the lower drive member (tube) is slid along the cord 202 till it is accepted by the fitting, the cord guiding the tube into engagement with the threaded fitting.

In some locks, the same arrangement is employed in relation to the upper drive member. In other locks, shown in Fig 8 and 9, the upper drive member comprising a tube connected to an **upper drive slide 211** by a rigid joint comprising opposed elongated **shell portions 212** that together comprise a substantially cylindrical **spacer member 216** having an external diameter the same as the internal diameter of the tube and an cylindrical **axial aperture 217** the same as the diameter as the drive slide and an internal sideways **pocket 218** that extends from the axial aperture to accept a sideways protruding **bump 219** of the drive slide to restrain the drive slide axially relative to the spacer member. During assembly, the shell portions are assembled around the end of the upper drive slide to locate the bump 208 in the pocket 207 and the spacer is then inserted into the end of the upper drive member 158, whereupon the upper drive member is crimped (dented on a side) to retain the spacer member 205 and upper drive slide 203.

The upper drive slide has a **return portion 220** that is connectable (during lock installation) into the **aperture 221** in the driver annulus to comprise the first joint 171. The upper drive slide includes a **dog leg portion 222** to enable the drive member 159 to be halfway between the casing sides.

In one method of assembling the lock to the wing, the upper drive member is placed within the hollow section comprising the lock edge of the wing so that the upper drive slide protrudes from the lock aperture cut in the edge of the wing and the cord is extended to protrude from the lower end of the hollow section. The lock is tilted to enable the upper drive slide to be connected to the driver annulus – this being facilitated by a side **angled cut out 223,** shown in Fig 22, of a side of the lock casing include to expose the aperture while enabling sideways assembly of the return portion 209 into the aperture 210. The lock is then rotated to the upright position and placed in the wing cut-out to be fixed to the wing and the lower drive member 159 is assembled to the fitting 195 as described above.

In pivotal and rectilinear locks, as shown in Fig 24, where the remote locks are connected by **Bowden Cables 224** and the cables are to operate in the same direction, the **lower inner cable 225** has right angled **return portion 226** that locates in a recess in the driver annulus 160 to comprise an **alternative first joint 227** that is substantially coaxial with the first joint 171 but on the opposite side of the drive annulus and the **upper inner cable 228** has a right angled **return portion 229** that locates in a recess in the driver annulus to comprise the first joint 171. In these locks, the casing channel 192 is adapted to provide an **open channel 230** open from the rear of the casing that extends from the driver annulus to the lower end of the casing to provide passage for the lower Bowden Cable and to enable the cable to be assembled into the channel. Adjacent to the driver annulus is a **slotted aperture 231** in a fixed casinf portion to receive and restrain the **end 232** of the **lower outer cable 233** and adjacent to the driver annulus there is a **slotted aperture 234** to receive and restrain the **end 235** of the **upper outer cable 236**. In some locks, the Bowden cable comprises a cable within a semi-rigid tube. In some locks, the inner cable comprises a single strand of wire and in other it comprises multiple strands.

In some locks, as shown in Fig 13 there is an unlatching lever having a substantially cylindrical shank portion 237 that is supported within a substantially cylindrical through aperture 238 in an substantially cylindrical underside boss 239 of the lever backplate 240, the aperture having an opening to the face of the back plate and terminating within the underside of the backplate in a circular annular washer-face 241. The shank preferably has a sideways protruding retention shoulder 242 and underside boss is longitudinally slotted 243 to provide passage for the retention shoulder – the slot 230 and retention shoulder being configured such that in normal operation they are never aligned. In usage, the shank is fed through the slot and it is then rotated so that the retention shoulder abuts the annular washer-face.

In other handle sets, the lever is retained by a circlip fitted to the shank of the lever beneath a disc-like member as is common.

The invention provides a springing system for a lever that provides for simple and ready conversion between handed types and without the use of hand tools. It provides biasing for a lever that biases the lever towards an undisplaced disposition irrespective of the direction in which it has been displaced from the undisplaced disposition.

In some embodiments, the lever is attached to the disc-like member supported on the lever shaft on the underside of the backplate. The disc-like member having inwardly projecting substantial radial fingers that locate in longitudinally elongated slotted recesses of the lever shaft to couple the disc-like member and lever shaft. The disc-like member has a pair of substantially horizontally opposed apertures to receive return portions of a pair or substantially vertically disposed tension springs wherein at a position radially disposed from the lever pivotal axis (disposed towards the lever arm) one aperture is connected to an extended softer spring (this spring having a longitudinal axis that does not intersect the axis of the rotation of the lever and therefore giving rise to a moment on the disc-like member urging it to rotate in a first direction). The other aperture is connected to a substantially unextended harder spring (having a longitudinal axis that does not intersect the axis of the rotation of the lever and therefore giving rise to a moment on the disc-like member urging it to rotate in a direction opposite the first direction). The stronger spring in this function acts as a solid member whose length is configured to retain the handle in an undisplaced disposition (commonly a horizontal lever). The stronger spring is preferably pre-tensioned so that an initial load must be applied to the spring before it extends at all.

In a preferred embodiment as shown in Figs 13 and 30 , the lever comprises the lever described above having the protruding retention shoulder 242 and the disc-like member comprises a cupped member 244, enveloping the underside boss and having an axial aperture 245 to provide passage to and to mate with a drive shaft 246 that also mates within an axial drive recess 120 of the shank to thereby operably couple the cupped member and lever. The cupped member includes sideways disposed opposed side apertures 249 disposed from the pivotal axis of the lever

One of the apertures 250 disposed towards the lever arm is occupied by a right-angled return portion 251 of a vertically elongated extended tension spring 252 that is connected at the upper end to a rail 253A of the underside of the back plate, the spring urging the cupped member to rotate about its axis and hence the unlatching lever to displace upwardly; the spring having a return portion 400 on the

other side of the rail to comprise a U shaped spring end 401 so at to be retained adjacent the rail. The other apertures 254 disposed away from the lever arm is occupied by a right-angled return portion 255 of a vertically elongated much stronger (substantially unextended) tension spring 256 that is connected at the upper end to the rail 253A, the stronger spring acting as a stop means to restrain the cupped member against rotation from the undisplaced position of the cupped member by the softer spring, the spring having a return portion 402 on the other side of the rail to comprise a U shaped spring end 403 so at to be retained adjacent the rail.

In usage, downward displacement of the unlatching lever, causes the softer spring to stretch more (to urge the cup with even greater force towards the undisplaced disposition) while the stronger spring exerts no force being displaced upwardly substantially as a rigid member as the U shaped end 403 of the stronger spring slides over the rail while being retained adjacent the rail; and upwards displacement of the unlatching lever, as shown in Fig 31, causes the harder spring to stretch and the softer spring to become less stretched with the overwhelming force of the stronger spring urging the cup towards the undisplaced disposition.

During fitting the handle set is convertible between left and right handed configurations by replacing the shaft with a temporary fitting- shaft that connects the handle and cupped member without protruding significantly from the cupped member and rotating the lever to a downwards position beyond the normal operating range (in which in usage it is retained by the shaft) as shown in Fig 33 and the stronger spring is configured such that the return 402 is from behind the rail when the lever is so downwardly displaced to enable the spring end 403 to be disconnected from the rail. When the lower portion of the softer spring has displaced to be past the pivotal axis of the shaft recess (and the fitting-shaft), the stronger spring end 403 is re-attached to the rail by placing the end portion 402 behind the rail on the rail. Lever displacement back into the normal operating range causes the U shaped end 403 to be engaged with the rail as described above and so the lever displaces towards the undisplaced position the spring end 401 displaces outwardly by sliding along the rail to assume an undisplaced position that is on the opposite end of the rail from which it was before re-handing and the portion strong spring adjacent the end 403 is similarly displaced to an end of the rail opposite that from which it was released. At that time the fitting-shaft is removed.

The cupped member before fitting of the shaft, abuts the boss to be supported by the boss but during fitting of the shaft, the cupped member is slightly displaced to be supported by the shaft with operating clearance between the cupped member side walls and the side walls of the underside boss so that the friction exerted on the

moving assembly (of cupped member, unlatching lever and drive shaft) is minimized – the cupped member being restrained horizontally between the circular annular washer-face 241 and the wing against which it is fixed. The rail, as shown in Fig 30, comprises a simple, horizontally elongated member 253A, preferably cylindrical in form, having a right angled return portion 406 at each end that are inserted into apertures 407 in the underside of the backplate to be retained there by friction and/or the side wall of the wing to which the handle assembly is attached.

In some forms of the invention (where the lever is not required to be displaced upwardly) the harder spring is replaced by an in-extendable member that acts only as a stop to restrain the lever against rotation in one direction and in some forms this comprises a link having return on each end as does the harder spring.

When the mechanism described above is applied to a lock having a latch bolt, it is preferable that the lever and back-plate be configured so that downwards lever operation causes the bolt to retract (while further extending the softer spring) and upwards operation causes remote bolts to be driven outwardly (while extending the harder spring). However, it is perfectly acceptable for the lever and backplate be configured so that downwards lever operation causes the bolt to retract (while extending the harder spring) and upwards operation causes remote bolts to be driven outwardly (while further extending the softer spring). The lock can, within this invention, be further configured so that the latch bolt is retracted by upward lever displacement and the remotes are driven out by downwards displacement.

The lock can, within this invention have a lever reversed simply by rotating the lever to the other side as required by the other handing if the drive shaft is not within the cupped member and lever because without the shaft there is no operable connection between the lever and cupped member – in this case however, in one handing unlatching is achieved against a softer spring, while in the other, unlatching is achieved against a harder spring. finish of amendment

Although (in the locks described immediately above) there is provision for operating remote locks, it will be appreciated that they may not, and need not, always be employed with the locks described above as the locks operate quite satisfactorily without remote locks – for this reason it can be said that the remote locks or remote engaging members are operably connectable to the driver (and lock) because they can be connected when so desired. In the context of this specification, a remote lock or remote engaging means comprises a remote engaging member that embraces a simple plunger like member, each said remote engaging member being connectable directly or indirectly to a vertically elongated drive member that is connectable to a drive slide or to the driver annulus and they include more sophisticated device where

a remote engaging member is actuated by an intermediate mechanism that in some cases includes a remote lock casing and in some cases includes means for separately deadlocking the remote engaging member and where independent deadlocking is effected by displacement of the driver annulus. The operative configuration of a remote engaging means is that in which it acts to restrain the wing in which it is supported and in the case of a plunger-like member it is the extended position where it protrudes from the wing.

Some rectilinear locks, as shown in Fig 19, include a **driven bolt 260** having a first portion comprising a substantially prism-like solid as shown in Fig 19, that has **angled sides 261** to assist the bolt enter the aperture in the catch plate joined to opposed parallel planar portions 262 at the **leading end** parallel the planes defining the sides of the bolt and a reduced distance apart of SS, the angled sides reducing the bolt width on each side by ½[bolt width – SS]. These driven bolts preferably include at least one full width **bridge portion 263** within the generally angled sides described above, that is defined in-part by two spaced parallel horizontal planes that define the extent of the bridge portion and bolt in general. This driven bolt 240 is employed with a driving **driving strike plate 264** that includes a substantially rectangular aperture as elsewhere described having a width substantially the same as the bolt (plus operating clearance) but further including an additional **clearance aperture 265** shown in Fig 19, extending exteriorly from the aperture and in a position adjacent each bridge portion. The clearance apertures extend horizontally for a distance not less than by ½[bolt width – SS] defined above and for a vertical height not less than the height of the bridge plus the vertical clearance between the aperture and general bolt. This driven bolt 260 and driving strike plate 264 together enable the bolt of a lock in a partly open hinged wing to partly latch by enabling the bolt leading end to enter the aperture when the wing is open by ½[bolt width – SS]. Once the bolt is partly in the aperture, the bolt can be driven outwardly to the fully extended position to displace the lock casing and the wing in which it is fixed to a fully closed position – this displacement taking place as a result of the angled side of the bolt sliding over the leading peripheral edge of the strike plate aperture.

The driven bolt can also be driven outwardly by deadlocking slide displacement as described.

The driven bolt can be driven outwardly displaced by displacement of the driver annulus to the fully displaced configuration as described above. In usage the wing would be closed by hydraulic closer or by hand to cause the bolt to partly latch and the unlatching lever would then be lifted to actuate the bolt and drive remote engaging members to the operative position.

Driven bolts (both advanced and otherwise) find application in wings that must be closed against a seal and that require a force to be applied to fully close the wing..

The integers described above are configurable so:

- the upper and lower elongated drive members each displace within a15 MM range
- the bolt when fully extended protrudes 16 MM from the casing
- the bolt has a width of about 12. MM
- the lock body has a width of 15.5 MM
- the backset is 30 MM
- the casing depth is 40 MM
- the unlatching levers rotate less than 40 degrees to unlatch
- the distance between cylinder and lever axii of 85 MM
- the bolt is in the middle of the front plate
- the front plate is interchangeable
- the control rocker interchangeable
- the backset can be changed by the addition of spacers
- the casing length does not greatly exceed 155 MM
- the bolt is angularly displaceable or rectilinearly displaceable

COMPLETE LOCKS EMPLOYING MULTIPLE INTEGERS DESCRIBED ABOVE

Locks having a double cylinder, locking lever and advanced latch bolt

Locks include a lock body comprising a casing, front plate, an advanced latch bolt, a deadlocking slide having a slide spring, at least one unlatching cam, an unlatching rocker, an interior and an exterior handle set each including an unlatching lever connected by a single shaft, and electively, an interior locking lever connected to a locking cam by a spindle, a free-rotation-double cylinder and cylinder screw, the lock being characterized by a first and a second locked configuration. Rectilinear lock also include an auxiliary bolt, a control rocker. Pivotal locks also include: a pivotal auxiliary bolt, a control slide.

These locks are configurable to electively include a driver annulus and an upper and a lower drive member connected to remote engaging members. The locks are also configurable to have any of the bolts and strike plates described herein.

In locks not to have keyed locking to the first locked configuration, the lock includes a **stop pin 266,** as shown in Fig 9, that passes between casing sides in the locus of displacement of a **horizontal shoulder 267** of the deadlocking slide to

restrain the deadlocking slide from being displaced upwardly sufficiently to enable the first cam arm to leave the drive recess.

In some such locks, (including those not having a slide spring 149) the deadlocking slide supports a spring loaded (sideways displaceable) **ball 268** as shown in Fig 3, to bias the deadlocking slide from leaving pre-determined configurations, said ball being is engageable in **recesses 271, 272, 273** in a side of the casing, said recesses corresponding respectively to an undisplaced deadlocking slide, a deadlocking slide in the second locked configuration and a deadlocking slide in the first locked configuration - both locked configurations correspond to a deadlocking configuration but in the second locked configuration the deadlocking slide is not displaced upwards sufficiently to enable the first cam arm to depart the drive recess whereas in the first locked configuration the first cam is departed from the drive recess.

When a slide spring is employed, the position of the deadlocking slide in the second locked configuration is the same position as it is in the first locked configuration.

Egress locks having a lockable exterior unlatching lever

In pivotal and rectilinear egress locks, as shown in Fig 12 and 13, an angularly displaceable interior locking member as described above, is operably connected to a stop blade described below within the exterior handle assembly – the locking member being displaceable to displace the locking cam to displace deadlocking slide into the deadlocking configuration while simultaneously displacing the stop blade to restrain the exterior unlatching lever against displacement. The deadlocking slide is displaceable from the deadlocking configuration by operation of the interior locking lever as described below. In egress locks having a slide spring 149 to restrain the first cam in the drive recess, the lock is characterised by both a third and first locked configuration and in egress locks not to have keyed locking to the first locked configuration, the lock includes a stop pin 252 as described above.

In egress locks, the exterior unlatching lever is connected to an **outer unlatching cam 274** by an **exterior shaft 275** and the interior unlatching lever is connected to an **inner unlatching cam 276** by a separate **interior shaft 277** - each drive shaft mating with its associated unlatching cam and unlatching lever and each unlatching cam being supported adjacently each other and each having an unlatching arm as described above and each being independently actuatable to cause the latch bolt to retract and when each includes a drive arm as described above, each is independently actuatable to actuate the driver annulus between its extreme dispositions. Egress locks include a locking cam configured as an **egress**

locking cam 278 that is similar to the locking cam describe above through which a spindle has passage (and with which the spindle mates) to mate within a **spindle recess 279** of a **lever locking cam 280,** as shown in Fig 13, supported on the underside of the **exterior lever backplate 281** by a shaft portion.

The locking cam is operably connected to a deadlocking slide configured as an **egress deadlocking slide 282** similar to the deadlocking slide described above, by an **locking cam arm 283** having a displaceable **free end portion 284** that overlaps a portion of the egress deadlocking slide, this free end supporting a sideways protruding pinned **shoulder 286** within a substantially **horizontal slotted recess 287** in a side of the egress deadlocking slide. The egress deadlocking slide and locking cam mating without free displacement.

The egress deadlocking slide as well as including the engaging shoulder 120 described above, also includes a ramped **unlocking shoulder 288** that lies in the same plane (a plane parallel a casing side) as the unlatching rocker and in a **third locked configuration** both the unlocking and locking shoulders are rearwardly disposed of the bolt, the engaging shoulder 120 to restrain the first bolt portion from being inwardly displaced and the unlocking shoulder 267 to be displaceable by the unlatching rocker as it displaces to retract the bolt - (Note: the ramped unlocking shoulder 288 does not extend into the locus of the bolt). The unlocking shoulder is engageable by an end **nose portion 289** of the second arm of the unlatching rocker as it rearwardly displaces to retract the latch bolt. In these pivotal and rectilinear egress locks, the bolt drive recess is of sufficient width to enable the unlatching rocker drive pin to freely displace sufficiently (while the bolt remains substantially undisplaced) to enable the nose portion to slide up the unlocking shoulder to displace the egress deadlocking slide downwardly whereby to displace the deadlocking shoulder from the engageable shoulder to enable the first bolt portion to be inwardly displaced by further unlatching rocker displacement while simultaneously displacing the locking cam to drive the spindle to unlock the exterior lever. [Alternatively if deadlocking is not required, the egress deadlocking slide may just include a ramped or radiused unlocking shoulder]

The **lever locking cam 280**, as shown in Fig 13, in both pivotal and rectilinear locks has at least one and preferably a pair of opposed **arms 291** situated one on each side of its pivotal axis each terminating in an **end shoulder 292.** A vertically displaceable **stop slide 293** supported between the **side walls 294** of the exterior back plate is biased by a compression **spring 295** towards the lever locking cam so that in an undisplaced position of the stop slide, a **horizontal lower edge 296** of the

stop slide abuts the end shoulders 270 to bias the lever locking cam 268 towards an undisplaced position.

The horizontal lower edge 273 includes opposed **entrances 297** to a curved face (defined by a radius) one of which is engaged by an end shoulder 292 when the lock is in the third locked configuration to restrain the stop slide 271 in the operative configuration. The stop slide 273 includes a **stop blade 298** that is upwardly displaceable to engage in a **stop slot 248** of the cupped member 231 operably connected to the exterior shaft. The stop slide is biased by the compression spring 295 within a vertically elongated spring **slot 301**, the spring acting downwardly on the **lower end 302** of the spring slot while acting upwardly on a **screw or screw boss 303** that intersects the spring slot to retain the stop slide 271 adjacent the back plate.

The entrances 297 are configured such that the stop slide cannot be displaced to dislodge a shoulder from the recess (this being possible by spindle rotation alone) because the vector defining the normal to the surface of the curved surface is configured to pass through the pivotal axis of the lever locking cam.

The components are configured such that when the egress locking lever and spindle are in undisplaced dispositions, the exterior unlatching lever 109 is unrestrained but when the locking cam has a disposition corresponding to the third locked configuration, the stop blade is within the recess. In usage, when the interior lever is pushed down to retract the bolt, the egress deadlocking slide is displaced to angularly displace the locking cam to angularly displace the spindle to unlock the exterior lever. As will be appreciated, the exterior lever can be both locked and unlocked by the cylinder from either side and by the locking lever from the interior.

In egress locks not to have keyed locking to the first locked configuration, the lock includes a stop pin that passes between casing sides in the locus of displacement of the egress deadlocking slide to restrain the deadlocking slide from being displaced upwardly from the position corresponding to the third locked configuration (a deadlocking configuration in which the first cam is restrained within the drive recess).

Where keyed locking to the first locked configuration is required, the stop pin is omitted and the deadlocking slide supports a spring loaded (sideways displaceable) ball as shown in Fig 3, that is engageable in recesses 133, 134, 135 in a side of the casing, the recesses 133 and 134 being connected by an elongated slot to provide free movement for the ball between these said recesses, the recesses corresponding respectively to an undisplaced deadlocking slide and a deadlocking slide in the third locked configuration and the first locked configuration.

Deadlatching locks operable by unlatching levers

As shown in Fig 14, in some pivotal and rectilinear locks having an advanced latch bolt, the bolt automatically deadlocks when it extends to the fully extended position, and in locks employing a slide spring they are characterized by a second and first locked configuration. These locks employ a **deadlocking slide 304** having a **spring wing 306** that protrudes into a **spring recess 307** as shown in Fig 3, of the casing to be acted on by a **spring 308** (Fig 14) that is within the spring recess to urge the deadlocking slide 280 towards the advanced bolt. With a view to standardising components, this deadlocking slide can also be configured to be substituted for the deadlocking slide described above in which locks the spring wing performs no function and the spring is omitted.

In these locks as shown in Fig 14, the locking cam comprises a **deadlatching locking cam 309** that is connected with free movement to the deadlocking slide by a **locking arm 310** having a displaceable **free end portion 311** having an **upper drive shoulder 312 and a lower drive shoulder 313** within a wide substantially **horizontal drive slot 314** within the deadlocking slide whereby to mate with relative vertical free displacement such that when the deadlocking slide has been displaced against biasing (from the deadlocking configuration) to the undisplaced position by the locking lever, the locking lever and cam can be further angularly displaced to cause the lower shoulder to leave the drive recess by sliding along a **lower exit shoulder 315** of the said slot, said exit shoulder in this configuration being defined in part by a vector normal to the surface that passes through the pivotal axis of the locking cam. When so configured, the deadlocking slide is restrained against displacing towards the bolt by the locking cam - this configuration being referred to as a spring-loaded configuration.

The first cam is actuateable to downwardly displace the deadlocking slide against biasing means to cause the upper shoulder of the deadlocking slide slot to displace the upper shoulder downwardly so that when the deadlocking slide is close to its undisplaced position, the lower drive shoulder is adjacent the lower exit shoulder, and a downward protruding **accelerator shoulder 316** of the horizontal slot (that disposed closer to the pivotal axis of the locking cam than the free end portion) is adjacent the locking cam arm, and further downwards displacement causes the locking cam arm to be displaced downwardly by the accelerator shoulder and so that the lower drive shoulder is displaced to overlap the lower exit shoulder (while not abutting it). When the deadlocking slide ceases to be acted on by the first cam, the deadlocking slide is upwardly displaced by the spring till it engages the overlapping lower drive shoulder that is now within its locus of movement. This causes the deadlocking slide to be restrained against further displacement; and in

this configuration, the accelerator is disposed from the locking cam arm to enable the arm to be displaced to free the deadlocking slide.

In usage, the locking member can be actuated to release the deadlocking slide from the pre-latching configuration to allow it to be displaced by the spring 308 to abut the underside edge of the bolt. In the case of rectilinear bolts, so when the bolt displaces during latching the lower edge of the bolt slides over the leading end of the deadlocking slide while restraining it against biasing means, and subsequently when the bolt becomes fully extended, the deadlocking slide is displaced by biasing means to deadlock the lock.

When the pivotal bolt is in the pre-latching configuration the locking cam can be actuated to release the deadlocking slide to abut a portion of constant radius of the bolt return portion so that when the bolt is displaced during latching, the bolt portion of constant radius slides over the leading end of the deadlocking slide while restraining it against biasing means, and subsequently when the bolt becomes fully extended, the deadlocking slide is displaced by biasing means to deadlock the lock.

To unlatch the lock, either the locking lever or cylinder can be operated to drive the deadlocking slide from behind the bolt and into the spring loaded configuration after which an unlatching lever is operated to unlatch the lock. However, if the lock has been locked to a first locked configuration it can only be unlocked from this configuration by actuation of the first cam.

In some deadlatching locks not to have locking to the first locked configuration, the lock includes a **stop pin** that passes between casing sides in the locus of displacement of the deadlocking slide to restrain the deadlocking slide from being displaced upwardly sufficiently from the second deadlocking configuration to a position enabling the first cam to depart the drive recess.

Where locking to the first locked configuration is required, the stop pin is omitted and the lock includes a slide spring and the deadlocking slide of the first locked configuration and second locked configuration in the same position. In these locks, the ball and spring are omitted to provide free movement to the deadlocking slide.

Deadlatching locks operable by cylinder

In other pivotal and rectilinear deadlatching locks, as shown in Fig 15, having an advanced latch bolt, the unlatching levers are omitted and the first bolt portion is displaceable to the retracted position by actuation of the first cam and/or by actuation of the locking member to cause the deadlocking slide to displace to the undisplaced position. In these locks, the foot of the deadlocking slide is connected to a vertically elongated blade like **link 317** that extends upwardly beyond while overlapping a

connecting arm 318 of a **modified unlatching cam 319.** A **pinned protrusion 320** of the foot preferably comprising a cylindrical pin protrudes into an **aperture 321** of the link to connect the two members. The connecting arm has a sideways **pinned protrusion 322** that extends into a vertically elongated **upper aperture 323** within the link to provide connection with free movement. The modified unlatching cam includes the driving shoulder that is engageable with the unlatching rocker as previously described and is otherwise the same as that described above. The lock includes a deadlocking slide configured as a **deadlatching deadlocking slide 324** being as the deadlocking slide but adapted to have a leading end **ramped shoulder 325** that extends rearwardly while extending upwardly to provide clearance for the bolt to displace inwardly. In the deadlocking configuration, the deadlatching deadlocking slide and bolt are enegaged as described elsewhere, but during displacement of the deadlatching deadlocking slide and link together from the deadlocking position, the first part of the displacement is devoted to removing the engaging shoulder from the engageable bolt shoulder and during this displacement of deadlatching deadlocking slide and link, the pin slides freely relatively within the upper link drive recess while the unlatching cam remains undisplaced. During the remainder of the link displacement, the pin abuts the upper end of the link recess to be acted on by the link whereby to be displaced downwardly to displace the modified unlatching cam to displace to displace the unlatching rocker to cause the bolt to be inwardly displaced. The lock is configured such that the deadlatching deadlocking slide is in the undisplaced configuration when the bolt is fully retracted and the ramped shoulder 325 is such as to provide clearance for the bolt.

In usage in rectilinear locks, the deadlocking slide in the pre-latching configuration abuts the underside edge of the bolt. When the bolt displaces during latching the lower edge of the bolt slides over the leading end of the deadlatching deadlocking slide while restraining it against biasing means, and subsequently when the bolt becomes fully extended, the deadlocking slide is displaced by biasing means to deadlock the lock.

When the pivotal bolt is in the pre-latching configuration the deadlocking slide abuts a portion of constant radius of the bolt return portion so that when the bolt is displaced during latching, the bolt portion of constant radius slides over the leading end of the deadlatching deadlocking slide while restraining it against biasing means, and subsequently when the bolt becomes fully extended, the deadlocking slide is displaced by biasing means to deadlock the lock.

In some deadlatching locks there is a locking lever while in others it is omitted. The lock includes a slide spring and the deadlatching deadlocking slide is in

same position for both the first and second locked configuration. In these locks, the ball and spring are omitted to provide free movement to the deadlocking slide.

Locks where the remote locks are operable by cylinder

In some pivotal and rectilinear locks as shown in Fig 16, the driver annulus is operably connected to the deadlocking slide by a vertically elongated **deadlocking slide extension 326** that preferably comprises a **blade 327** that extends along the rear of the lock and that has a return portion at each end, one of which shares an **alternative first pin joint 328** with the driver annulus and the other shares **another pin joint 329** with the foot portion of the deadlocking slide. In this form of lock, the deadlocking slide is preferably configured to displace about 11 MM as is common in security door locks, but if the axis of the alternative pin joint is a lesser radial distance from the axis of the annulus than the first pin joint and they are co-radial then a displacement by the deadlocking slide causes a larger displacement of the drive slides sharing first and second pin joints. By this means the vertically elongated drive members can be displaced15 MM by operation of the cylinder. In these forms of locks, the remote bolts are operated by actuation of the key and/or locking lever as is common in security door locks. The locks are configured such that the undisplaced configuration of the deadlocking slide corresponds to the undisplaced configuration of the driver annulus. In these locks the drive members are connected to the driver annulus as described elsewhere herein.

Lock for the subsidiary door of double French Doors

In some locks as shown in Fig 17, the latch bolt, auxiliary bolt and locking cam are omitted to provide a lock for the subsidiary door (that which has the strike plate attached) of a pair of French doors, the lock having one or a pair of remote engaging members operated by an unlatching lever as described above. These locks preferably include a horizontal **plunger recess 330** in a casing fixed member that extend through the driver annulus wall to expose the driver annulus. The plunger recess supports a **locking plunger 331** having a first portion that is horizontally displaceable against biasing means from a position where it protrudes from and through an aperture in the front plate to a retracted position where it is substantially within the casing. The locking plunger has a **return portion 332** that in the retracted position of the locking plunger engages in a **peripheral recess 333** of the driver annulus to restrain it from being displaced from the fully displaced position corresponding to extended remote engaging members.

This locking plunger is depressed when the other door is closed and when the front plate of the latter lock slides over the locking plunger to depress it – by this

means the subsidiary door is locked by the closing of the first door that preferably employs a lock with a latch bolt as described above.

Conventional passage lock where the latch bolt operated by lever from either side at all times.

This lock has an outwardly biased pivotal or rectilinear latch bolt, at least one unlatching cam, an unlatching rocker, interior and exterior levers connected by a single shaft to the unlatching cam, no cylinder nor locking member and the deadlocking slide and locking cam may electively be included. This lock may electively be configured to operate remote locks.

Conventional privacy lock having a rectilinear or pivotal latch bolt operated by lever from either side except when levers are locked by locking lever (snib) on inside.

This lock is based on the egress lock and has a lockable exterior lever and a locking lever connected to the exterior handle set by a spindle that passes through the lock body; it only has a single unlatching cam, a single rod and the cylinder, deadlocking slide and locking cam are omitted and the exterior handle set includes an exterior locking lever comprising hand operable coin slot that is connected to the locking cam by an extension to the spindle. Once locked by locking lever, the lock must be unlocked by locking lever to enable unlatching. The lock may be configured to operate remote locks.

Conventional patio lock where the deadlocking latch bolt is operated by lever from either side except when outside lever is locked by locking lever on inside. Automatic unlocking when inside lever is rotated or unlocked by locking lever.

This pivotal or rectilinear lock is based on the egress lock having a lockable exterior lever, an egress deadlocking slide, a locking lever, an egress locking cam, and levers connected by separate shafts to separate unlatching cams. The cylinder is omitted and the stop pin is included. The lock may be configured to operate remote locks.

Conventional entrance lock where the deadlocking latch bolt is operated by lever from either side except when outside lever is locked by locking lever or cylinder.

This pivotal or rectilinear lock is based on the egress lock but there is no locking cam and the spindle passes through an aperture in the casing to mesh in lever locking cam of the exterior handle assembly and the lock includes a stop pin to prevent the lock from being locked to the first locked configuration.

When the exterior lever is locked, the exterior lever may be operated after unlocking by key or locking lever. The lock may be configured to operate remote locks.

Conventional entrance lock where the deadlocking latch bolt is operated by lever from either side except when the outside lever is locked by locking lever on inside. When the outside lever is locked, the exterior lever may be operated after unlocking by key or by rotating interior lever which unlocks the exterior lever or by operating locking lever. The lock includes a stop pin to prevent the lock from being locked to the first locked configuration.

This lock is an egress lock as described above. The lock described may be configured to operate remote locks.

Conventional classroom where the deadlocking latch bolt is operated by lever from either side except when outside lever is locked by key from exterior. When the outside lever is locked, the latch bolt is retracted by rotating the interior lever or by unlocking the exterior lever by key and then operating exterior lever.

This lock is based on the egress lock but there is no locking cam and the spindle passes through an aperture in the casing to mesh in lever locking cam of the exterior handle assembly and there is a stop pin to prevent the lock being locked to the first locked configuration. When the exterior lever is locked, the exterior lever may be operated after unlocking by key or locking lever. The lock may be configured to operate remote locks.

Conventional F91 lock where the deadlocking latch bolt operated by lever from either side except when both levers are locked by key from either side.

This lock is as the standard lock described above. The lock electively includes a locking member. The lock may be configured to operate remote locks.

ALTERNATIVE: FUNCTIONALITY AND INTEGER FORMS

latch bolt

The advanced latch bolt first portion in some forms comprises a substantially **prism-like solid 334** as shown in Fig 18, and electively;

comprises **ramping bolt 336** as shown in Fig 19;

has a **leading end profiled on both sides 337** as shown in Fig 2 (to accommodate both left hand and right hand hinged doors) to facilitate latching wherein the leading portion is chamfered and/or curved, or otherwise profiled on each side to assist latching wherein the latch bolt is engageable on either side by a strike plate to be inwardly displaced by the strike plate during latching, said profiling in some forms comprising a simple radius on the edge defining the junction between the side of the bolt and the outer end of the bolt;

the latch bolt in the fully extended position is extended so far that it could not latch with the strike plate unless it were restrained in the pre-latching configuration;

comprises a substantially prism-like solid having a slot in which is supported at least one and preferably a pair of counter-acting pivotally displaceable hooking arms, as shown in Fig 22 and 23, that are displaced from the bolt as the bolt displaces to the fully extended position and in some forms of this bolt, there is a **horizontal slot 338** extending from one side to the other and each **hooking arms 339** is supported to be displaceable from a side of the bolt, each hooking arm terminates at the inner end with a sideways protruding **control shoulder 340** and at the other, outer end in a **hook 341** that is displaceable from within the bolt to protrude from the side of the bolt, to engage behind the **aperture edge 342** within a **catch plate 343** or **strike plate 344** as whereby to become longitudinally engaged, each arms is supported by a vertical **pin 345** that has passage through an aperture in each arm, said pin defining the vertical pivotal axis of each arm, the hooked arm is configured such that as the bolt displaces towards the fully extended position, each control shoulder is brought into contact with the **inside face 346** of the front plate and as the bolt further extends, the arm is forced inwardly by the front plate aperture edge to displace each hook outwardly – the **front plate aperture edge 342** exerting a moment on each arm to cause it to displace so when the bolt is displaced towards the retracted position from the fully extended and engaged configuration, the strike plate or catch plate aperture edge acts on the hooks (or ramped surface) to displace the hooks into the bolt envelope where they are retained by the front plate aperture edge – the hooked arm being so restrained when the bolt is in the pre-latching configuration and until the hooks have entered the strike plate or catch plate aperture during latching. In other forms, each hook is replaced by a **ramped shoulder 348** - the above-described bolt being suitable for both hinged doors when used with a strike plate and sliding doors when used with catch plate, and the width **w1**, of the bolt first portion is preferably of reduced width to be less than the width of the bolt return portion **w2** so that the bolt with outwardly displaced control shoulders can displace within the sides of the casing;

the advanced latch bolt first portion in some forms comprises has **radiused corners 349 to** provide increased front plate strength and the **corners 350** of the strike plate aperture are also preferably radiused.

The advanced latch bolt first portion in some forms comprises a substantially half a solid prism having a **bevel 352** on one side, as shown in Fig 20, that extends from top to bottom and from the **leading end 353** of the bolt as is common in bevelled latch bolts and the latch either has or does not require a pre-latching configuration and accordingly either is or is not accompanied by an auxiliary bolt;

the advanced latch bolt first portion in some forms comprises a hand **actuatable bolt** and the driver annulus includes the secondary drive shoulder and the unlatching rocker includes the secondary driven shoulder, in some forms this bolt comprises a latch bolt as described above and in other forms the lock comprises a bolt as described but without the bolt biasing means.

Cylinders

In some locks the first cam takes the common form described above where it has the radially protruding arm described above. In some locks the first cam is operably connected to at least one key operable barrel in one of the following ways: the first cam is operably connected to a key operable barrel supported within a **single cylinder housing**; a **double-cylinder** comprises opposed barrels each operably connected to the same first cam; the double cylinder comprises a **clutched-double-cylinder** having opposed barrels each connectable without free movement to the same first cam such that the cam can be angularly displaced by a barrel while the other barrel remain undisplaced, the cylinder includes a clutch to select which barrel is the operative barrel, said clutch being operated by key insertion; the single cylinder comprises a **free rotation single cylinder** comprising a key operable barrel within a **cylinder housing** operably connected with free movement to a **first cam** to enable the cam to be displaced by barrel to a locking configuration and then the barrel to be reverse rotated to an undisplaced position enabling key removal; the double cylinder comprises a **free rotation-double-cylinder** comprises opposed barrels each connected with free movement to the same first cam such that the cam is free (between limits) to be angularly displaced while the barrels remain undisplaced, this type of cylinder being commonly used in security door locks in Australia to enable the cam to be displaced by either barrel to a locking configuration and then the barrel to be reverse rotated to an undisplaced position enabling key removal while leaving the first cam in the locking position, (this type of cylinder being distinct from the more commonly used double cylinders that employ; in forms of both clutched and free rotation cylinders, a barrel is replaced by a hand operable turn knob; some single cylinder comprise a subassembly including a housing while in others, the housing comprises part of the handle backset, and some comprises a separate member and some double cylinders comprise a subassembly including a housing while in others, the double cylinder housing comprises portions of the handle backplate; a pivotal lock is defined herein as a lock having an angularly displaceable bolt herein called a pivotal bolt; a rectilinear lock is defined herein as a lock having a rectilinearly displaceable bolt herein called a rectilinear bolt.

In some standard, egress and deadlatching locks, there is an exterior locking lever, as described in [Watts AU 18474/2000] that hereby included by reference, that is operable to displace the lock into the second or third locked mode but which is not operable to displace the lock from the second locked mode.

Auxiliary bolt

In some locks, the first auxiliary bolt first portion comprises a prism-like member as shown in Fig 2, having a **leading end 347** profiled on both sides to accommodate both left hand and right hand doors wherein the profiled portion on each side is curved, chamfer or otherwise profiled to facilitate latching wherein the auxiliary bolt is engageable on either side by a strike plate to be inwardly displaced by the strike plate during latching.

Strike plate

In some locks, the strike plate comprises an improved **strike plate 360** as shown in Fig 25 that comprises a substantially conventional strike plate having a **wing 361** to facilitate latching, an **aperture 362** to provide passage for the bolt and upper and lower portions that are attachable (usually by screws) to the element defining the opening, said aperture may extend to one or more clearance apertures. The aperture of the improved strike plate includes a **front edge 363** against which the bolt is urged when the door is urged in an opening direction as occurs when one attempts to force open a locked door. The substantially conventional strike plate in preferred forms, is modified to resist jemmying by enabling the portion of the strike plate adjacent the front edge to be displaced with the bolt while the portions attached to the opening remain attached to the opening while being subjected to forces that tend to pull the strike plate away from the opening and that urge the fixing screws to pull out, however the further modified strike plate subjects the screws to considerably lower forces than are applied by a conventional strike plate. The aperture of this strike plate are within a substantially flat **plate-like portion 364** extending from between a **lower slot 365** to an **upper slot 366** and connected to the strike plate **wing 367** that preferably comprises an angled or curved wing and each said slot extends from the **rear edge 368** to pass between the screw aperture and aperture and preferably each slot further extends to include a **vertical portion 369** between the screw aperture and wing. Importantly, the front edge of the aperture is within a portion of the strike plate that is connected to the wing so as to be displaced with the wing. The strike plate wing is connected by **bridges 370** of reduced cross-sectional area and the strike plate is of a deformable material enabling these bridges to deform without cracking and the reduced areas enables deformation to occur at reduced forces – these characteristics enabling the wing to be angularly displaced about a

deformation axis 371 that passes substantially through each bridge. If forms where the front edge is rearwardly disposed relative to this deformation axis, rotation of the wing causes the front edge to be displaced towards the wing and bolt to bring the bolt into closer engagement with the strike plate. When a jemmy blade rests on the strike plate wing as it is rotated to part the wing from the opening, the blade angularly displaces to deform the bridges and to cause the wing to rotate about the deformation axis. The **upper and lower extremes 372** of the plate-like portion (that portion between the apertures and the slots) are of reduced cross-sectional area to enable these portions to deform under low forces so as to deform as the blade portion angularly displaces about the deformation axis. When these portions are caused to engage the face of the lock they deform so as not to inhibit the displacement of the wing about the deformation axis. The bridges connect to **fixable portions 373** that include **screw apertures 374** through which screws shanks have passage and by which the fixable portion is attached to the opening. In some types of deformation the fixable portions angularly displace about the screw to reduce the effective distance between bridges, and this feature combined with the fact that the wing is attached only at each to a bridge enables the wing and front edge to deform like a bow and at comparatively moderately low forces to thereby enable the front edge to displace with the bolt while the fixable portions remain attached to the opening while being subjected to reduced loads that urge the screws to pull out of the opening. In common forms of jemmy attack, when a closed and locked door is urged open under the action of a jemmy blade placed adjacent the bolt, the bolt is forced against the front edge while the lock is simultaneously displaced away from the strike plate and as a result, the bolt (in part, as a result of friction between the bolt and front edge) causes the strike plate to deform to enable the front edge to displace with it.

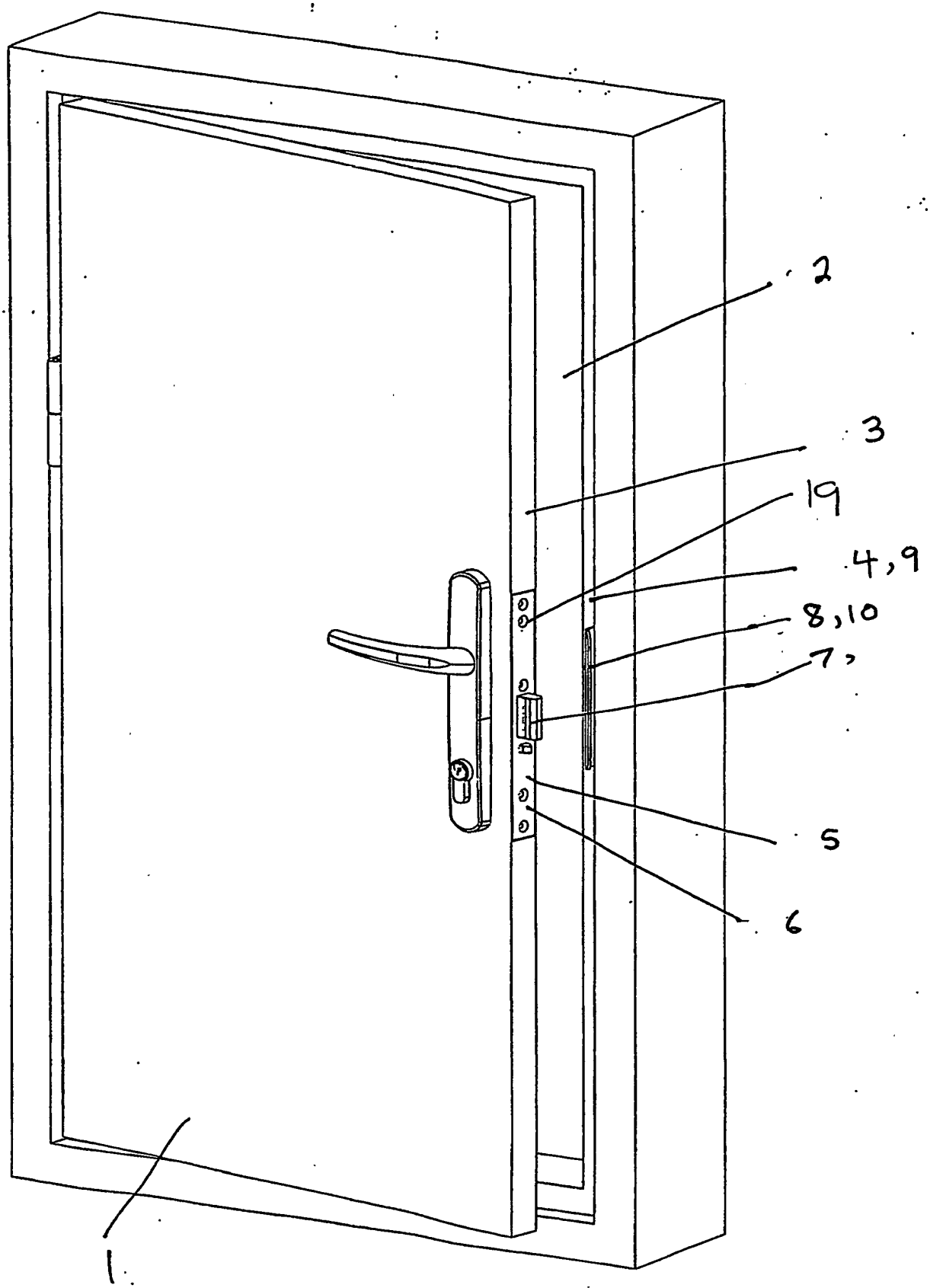

Fig 1

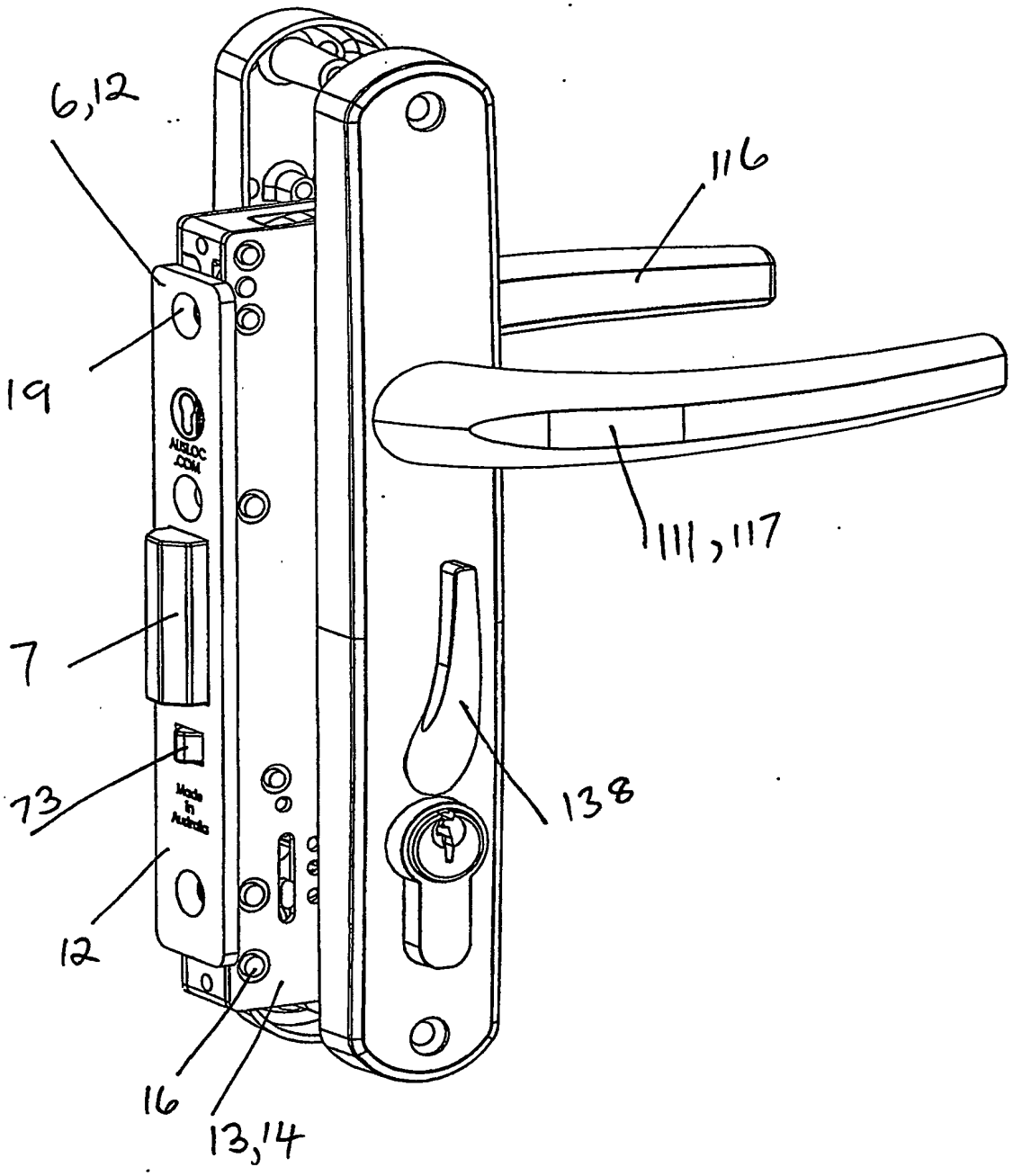

Fig 2

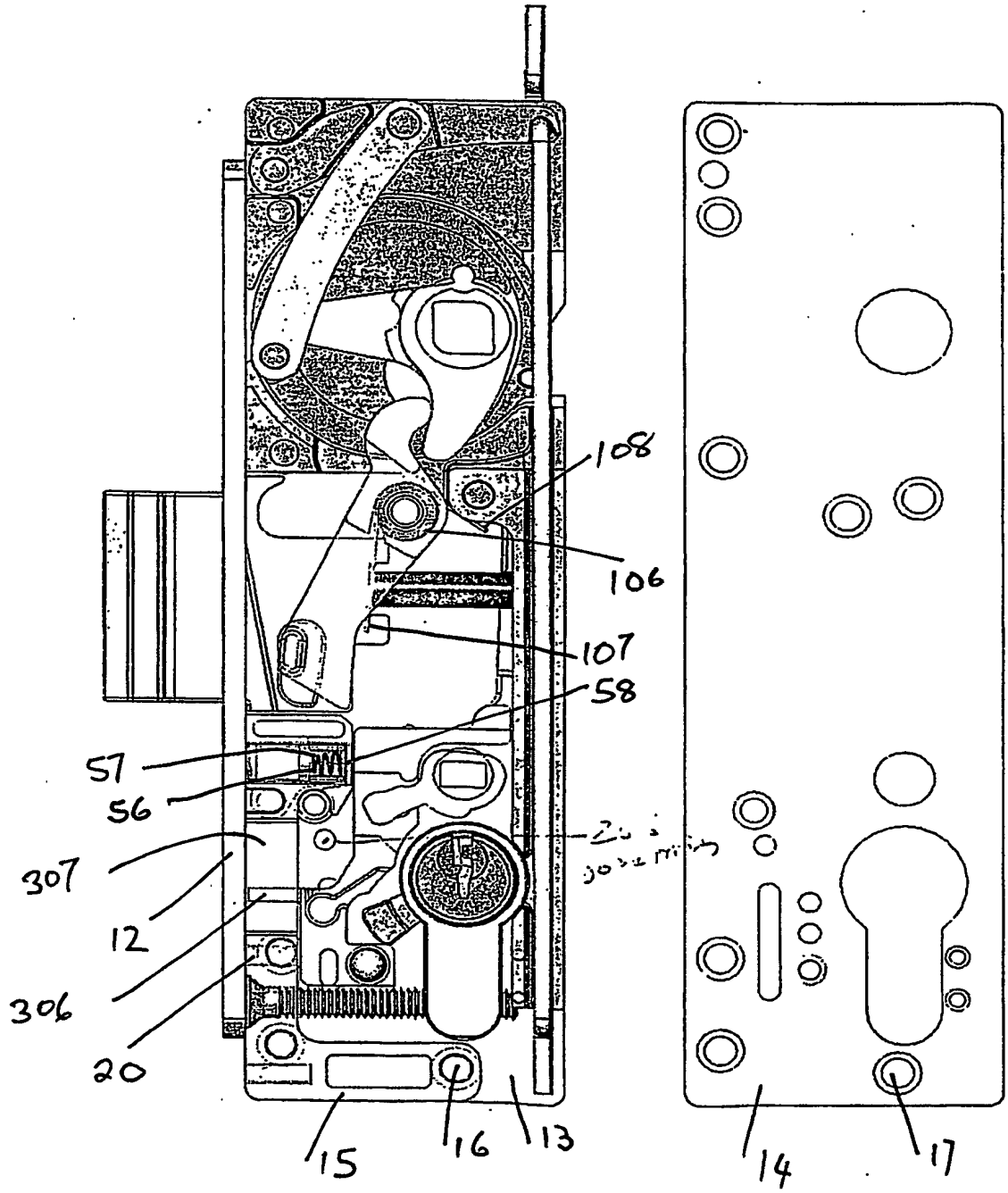

Fig 3

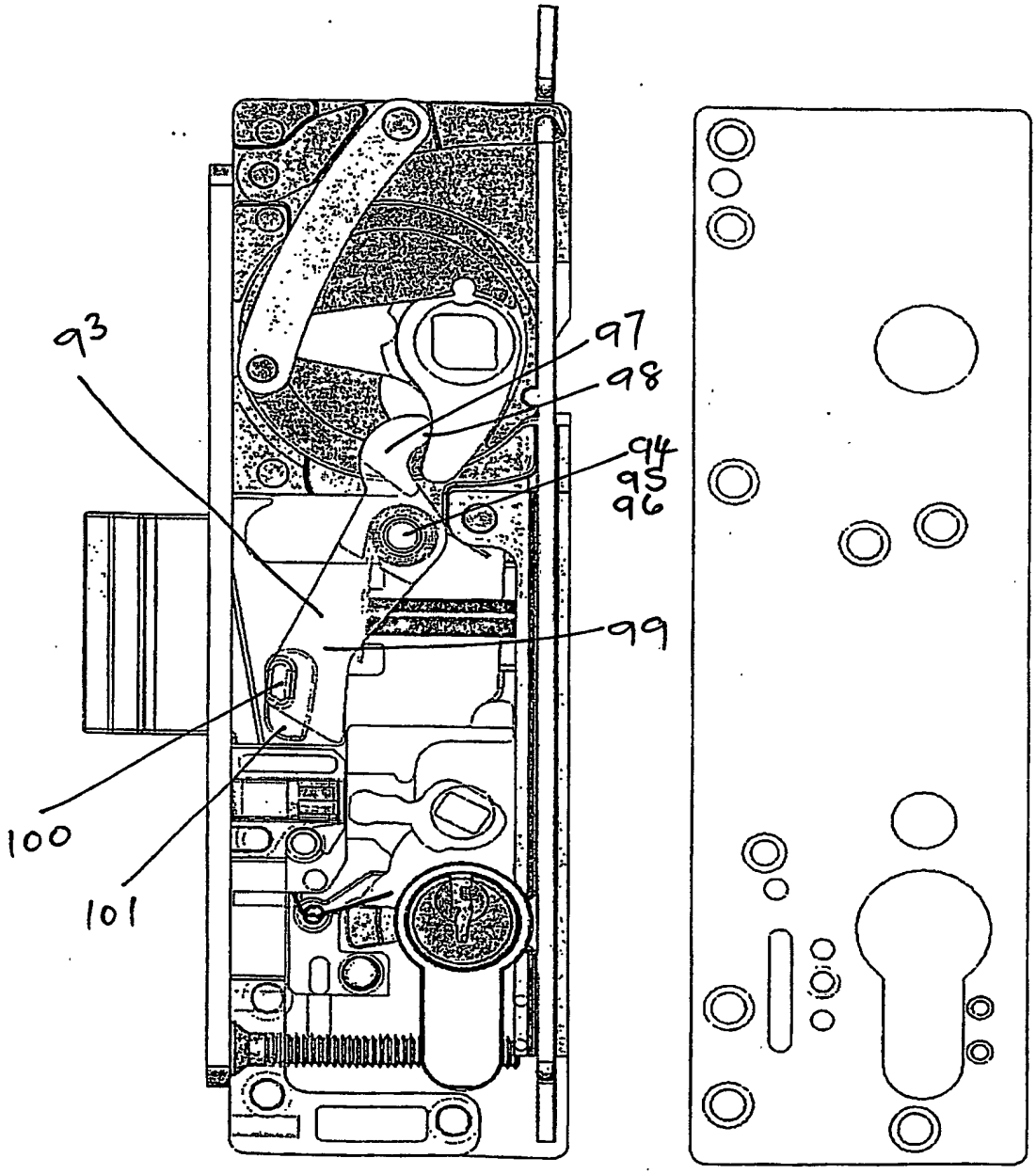

Fig 4

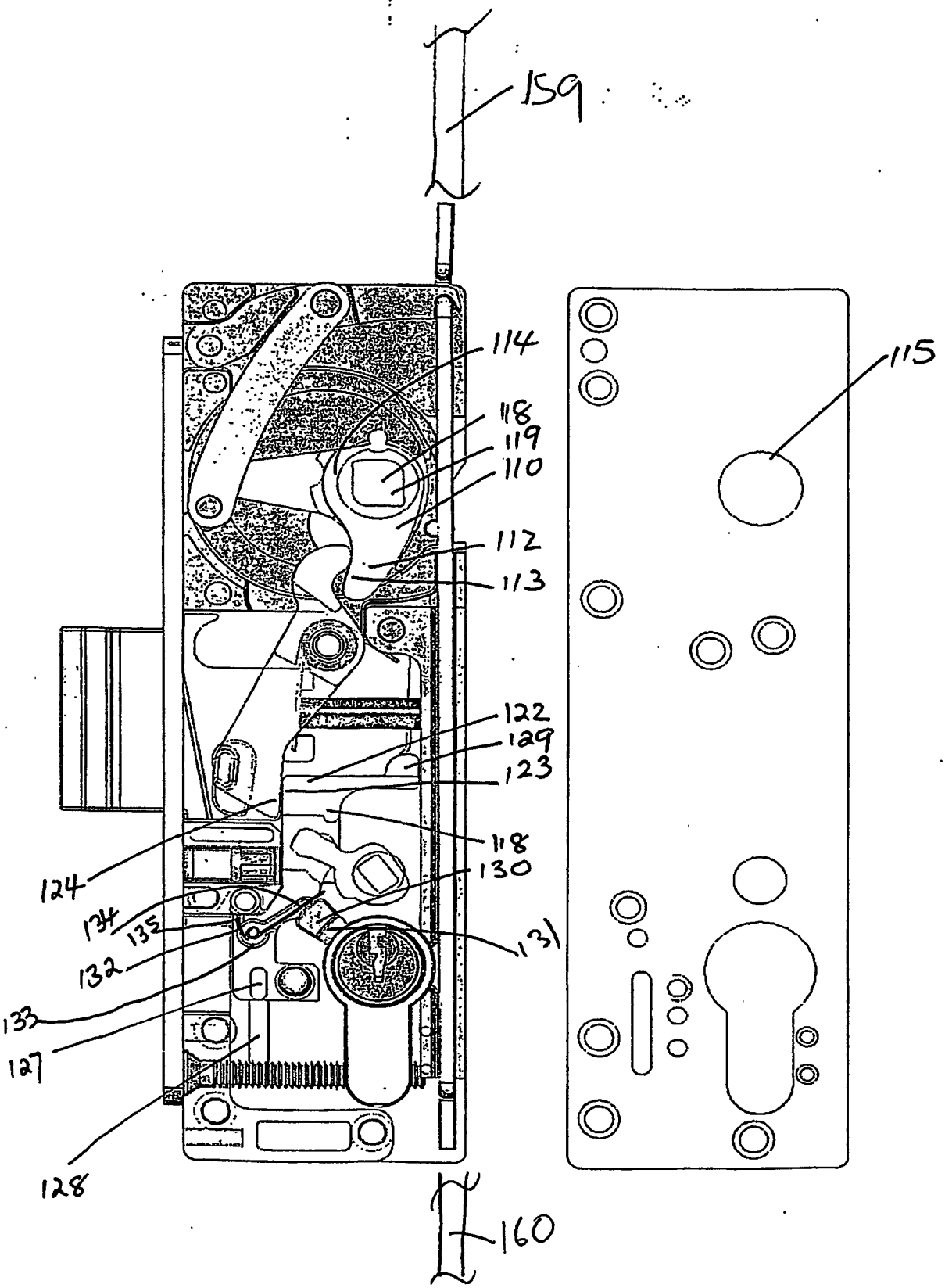
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Fig 5

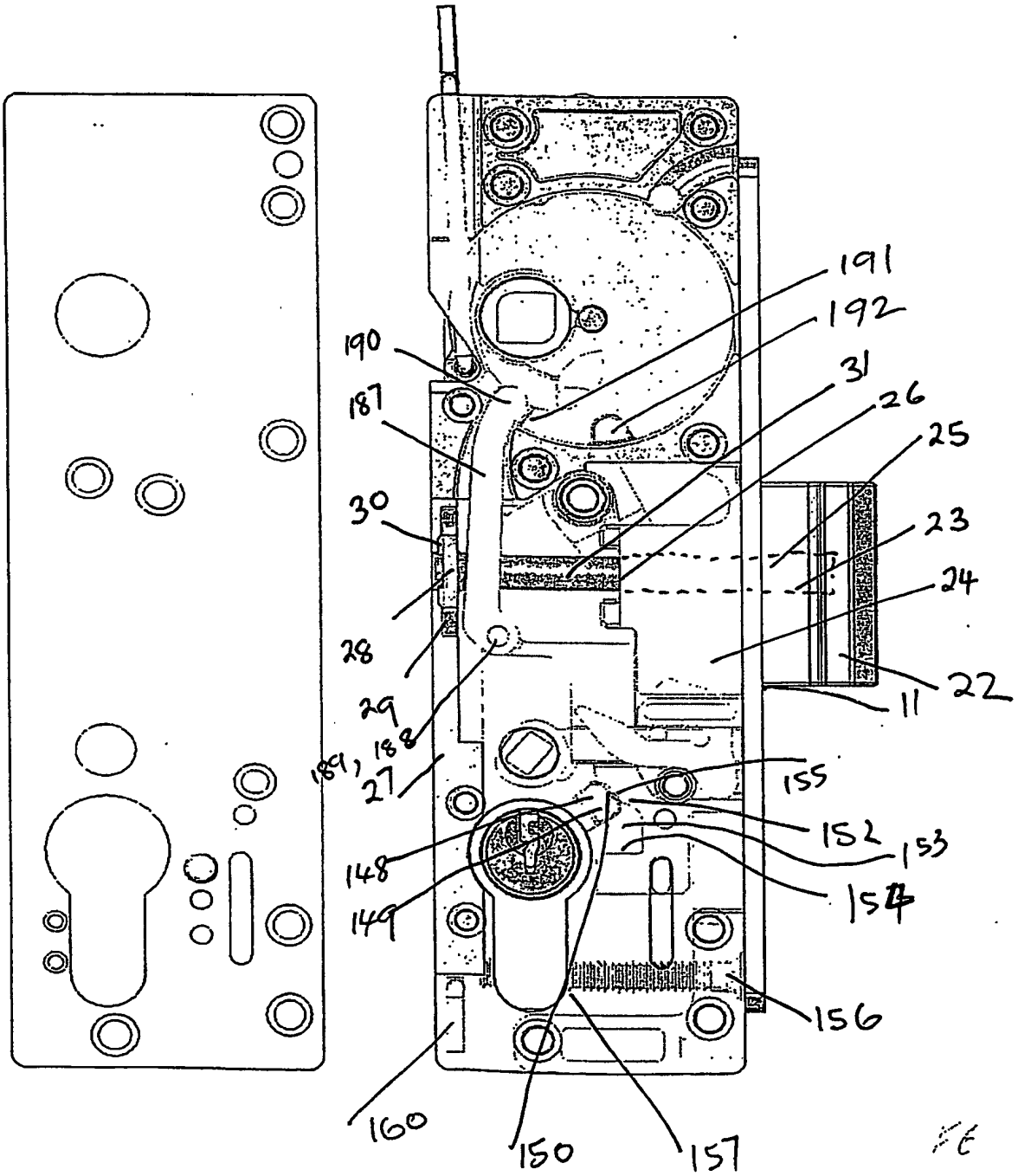
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Fig 6

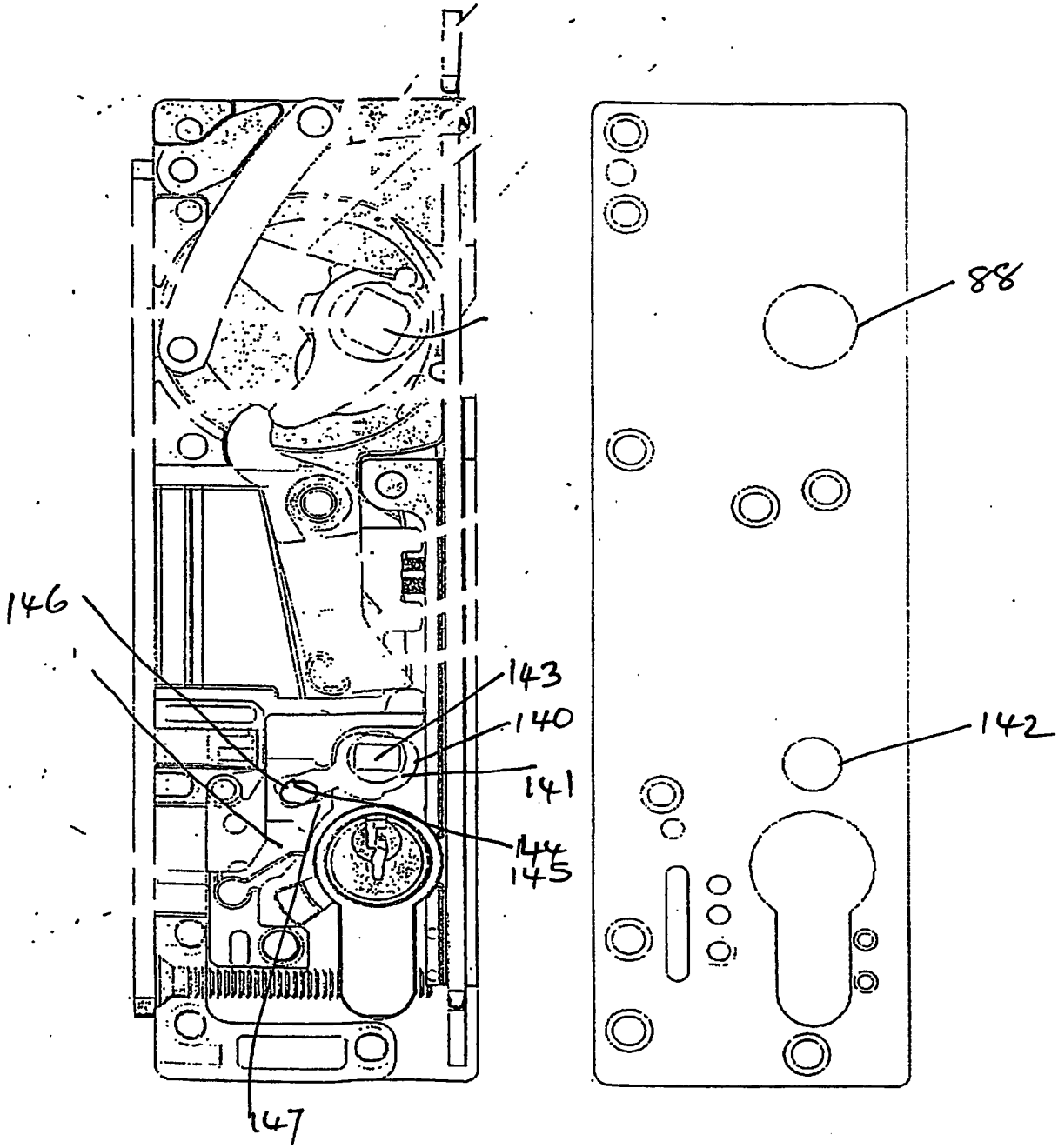

Fig7

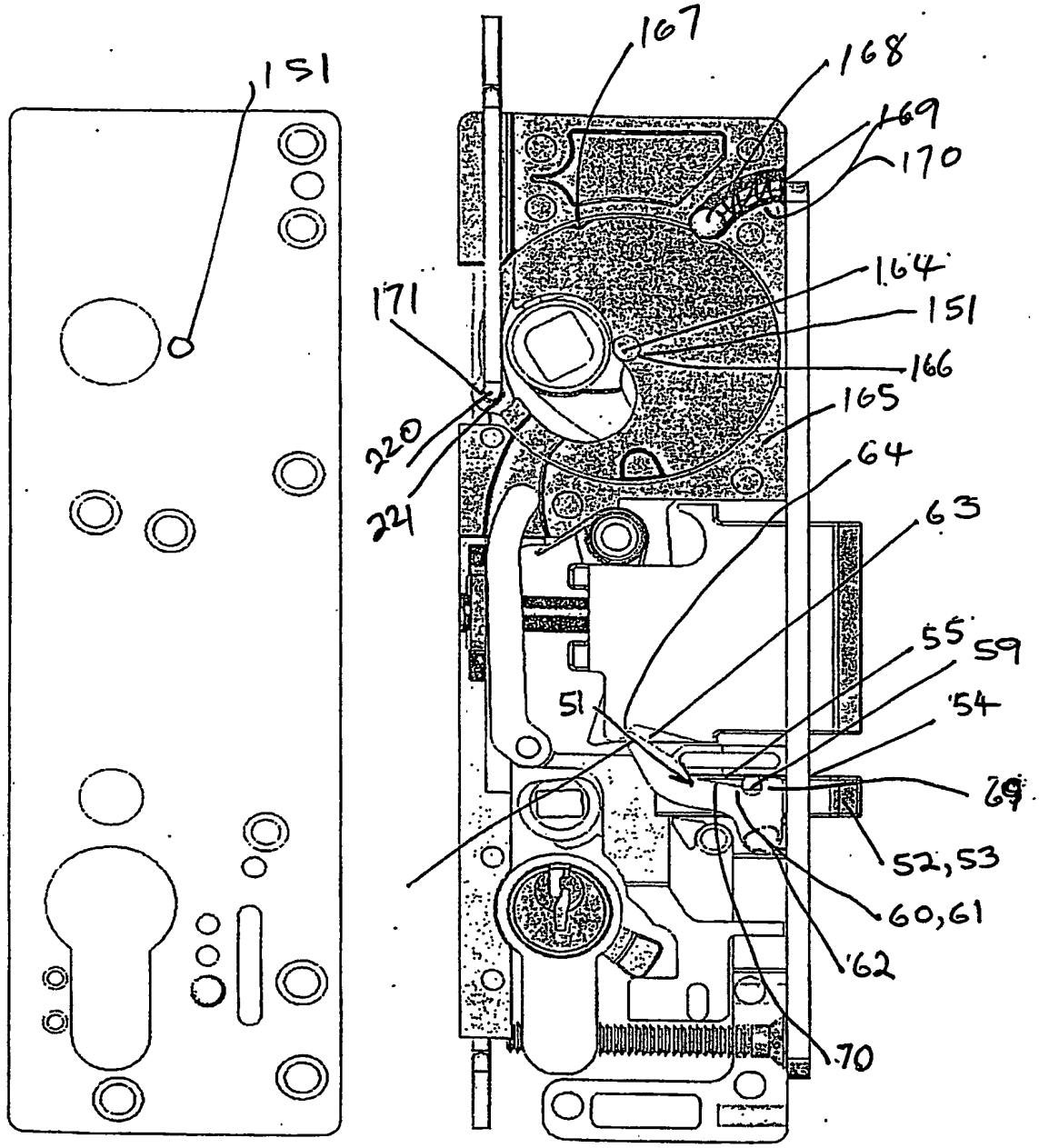
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Fig 8

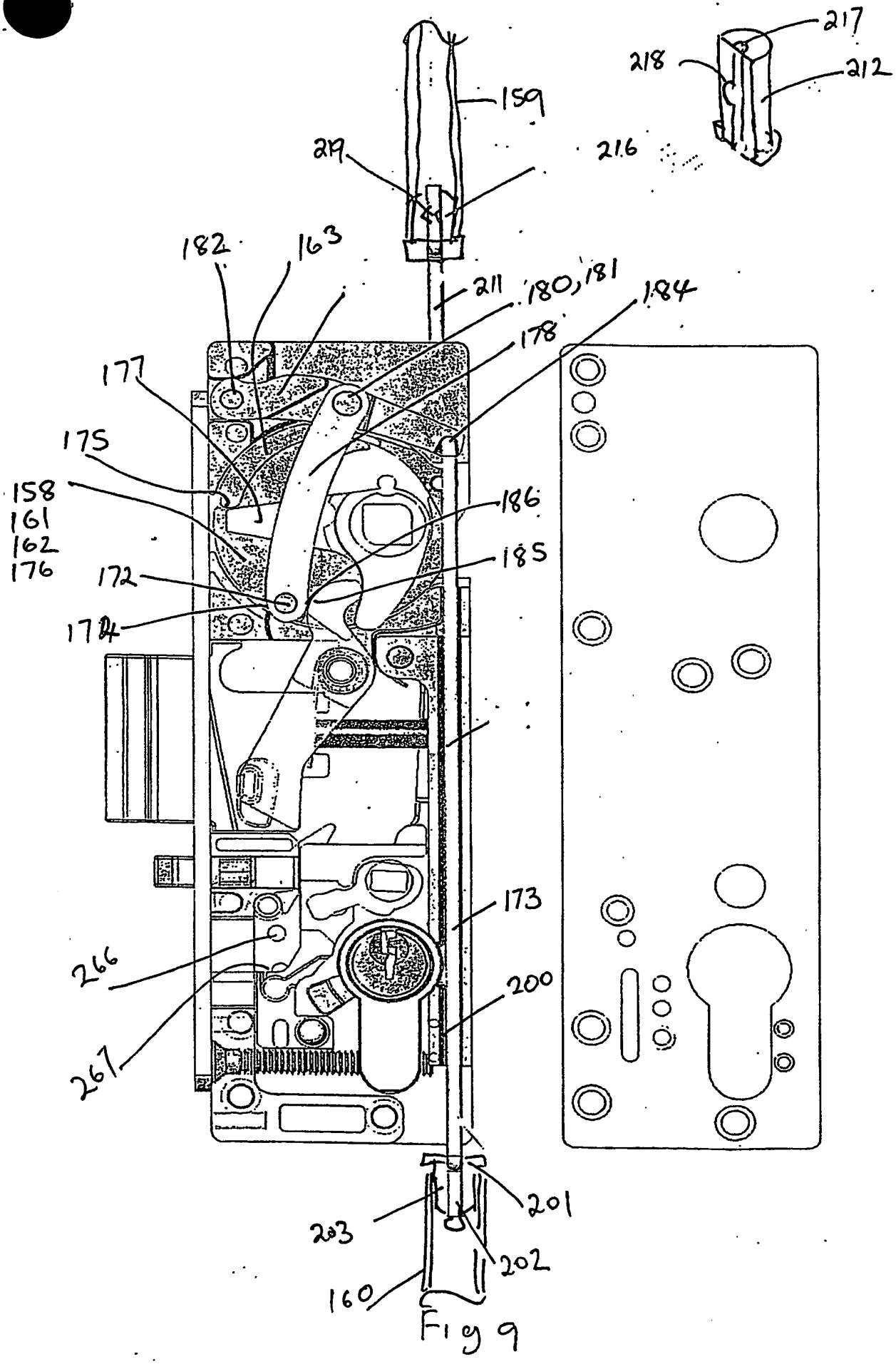
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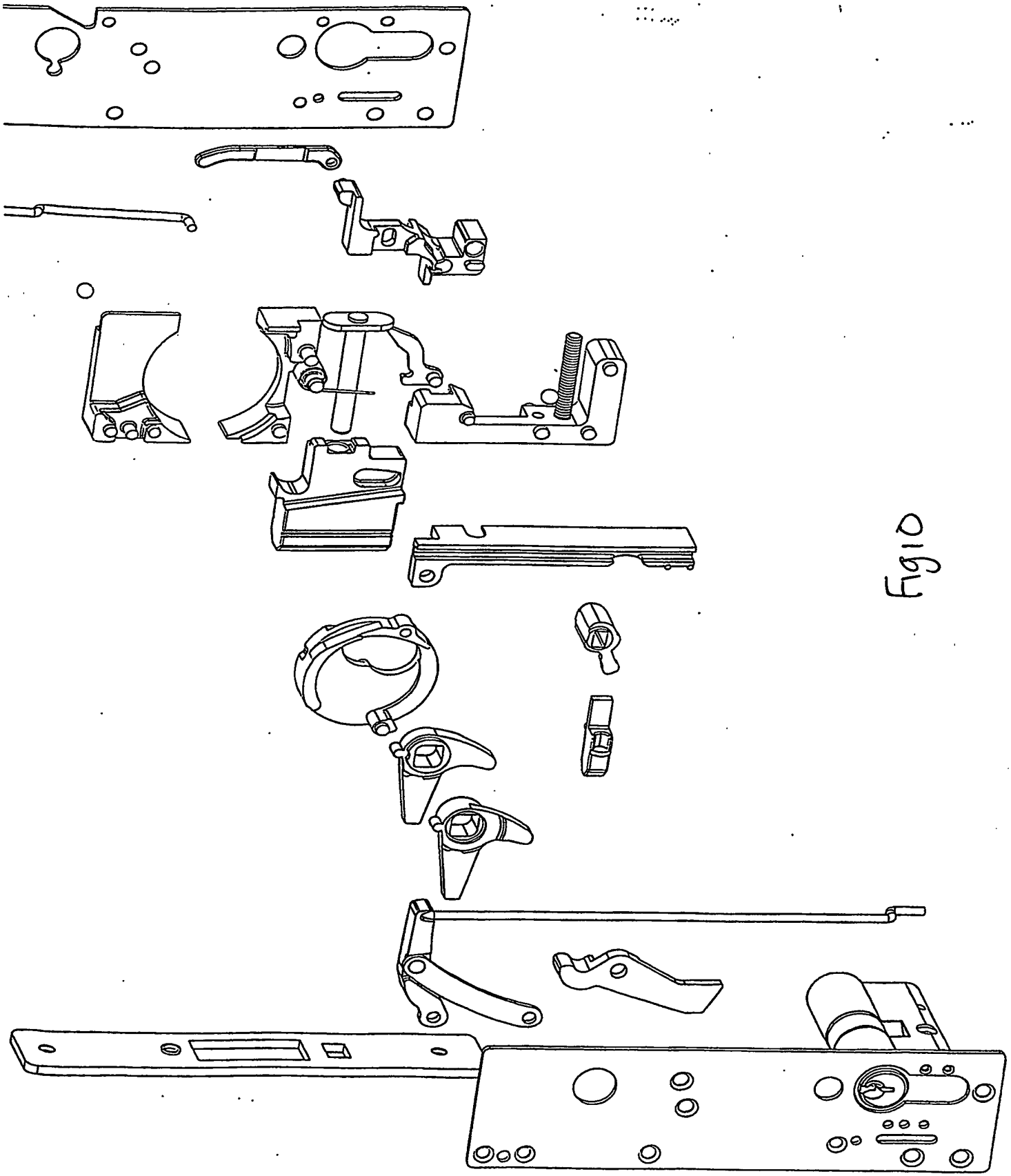
Fig 9



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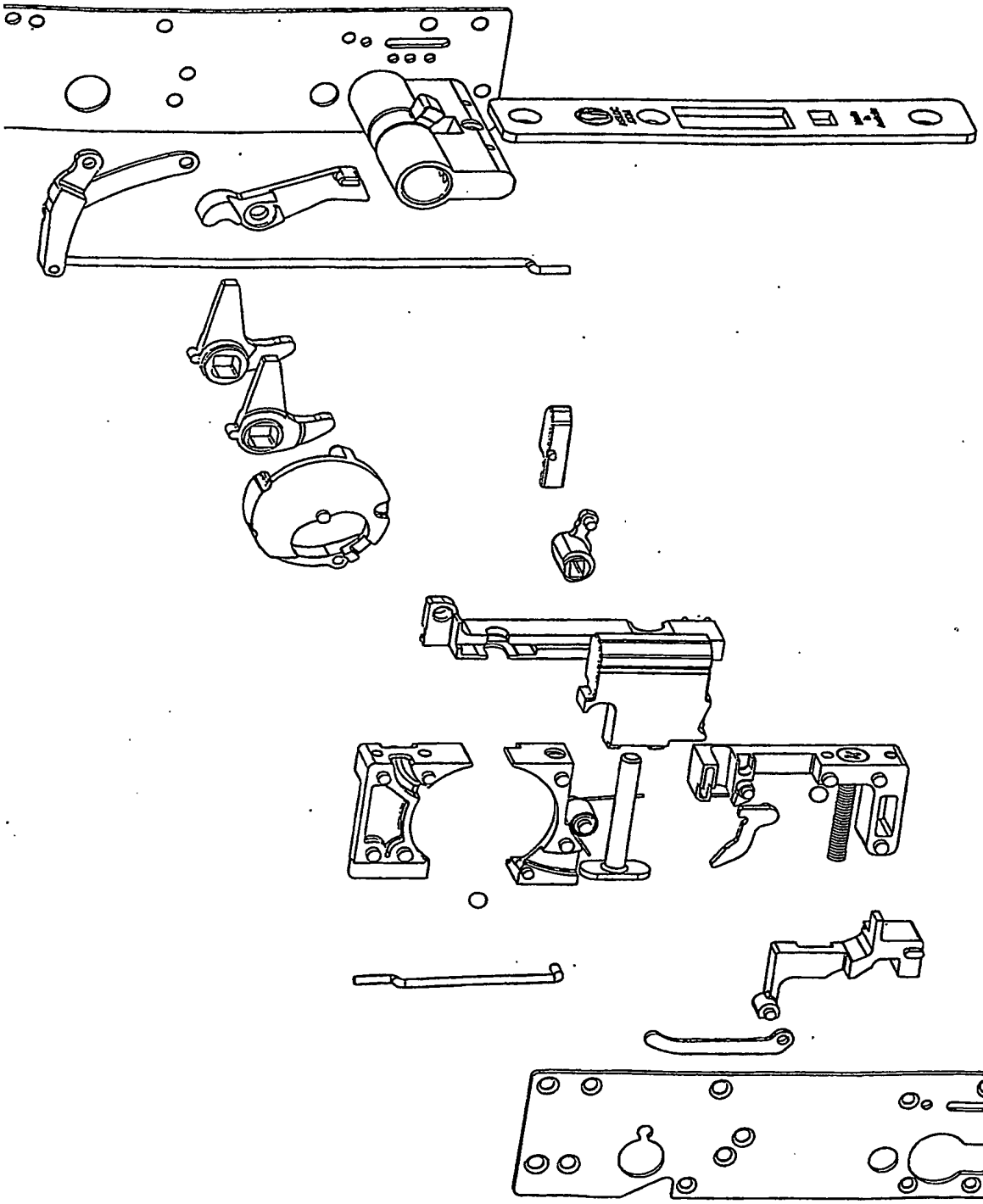

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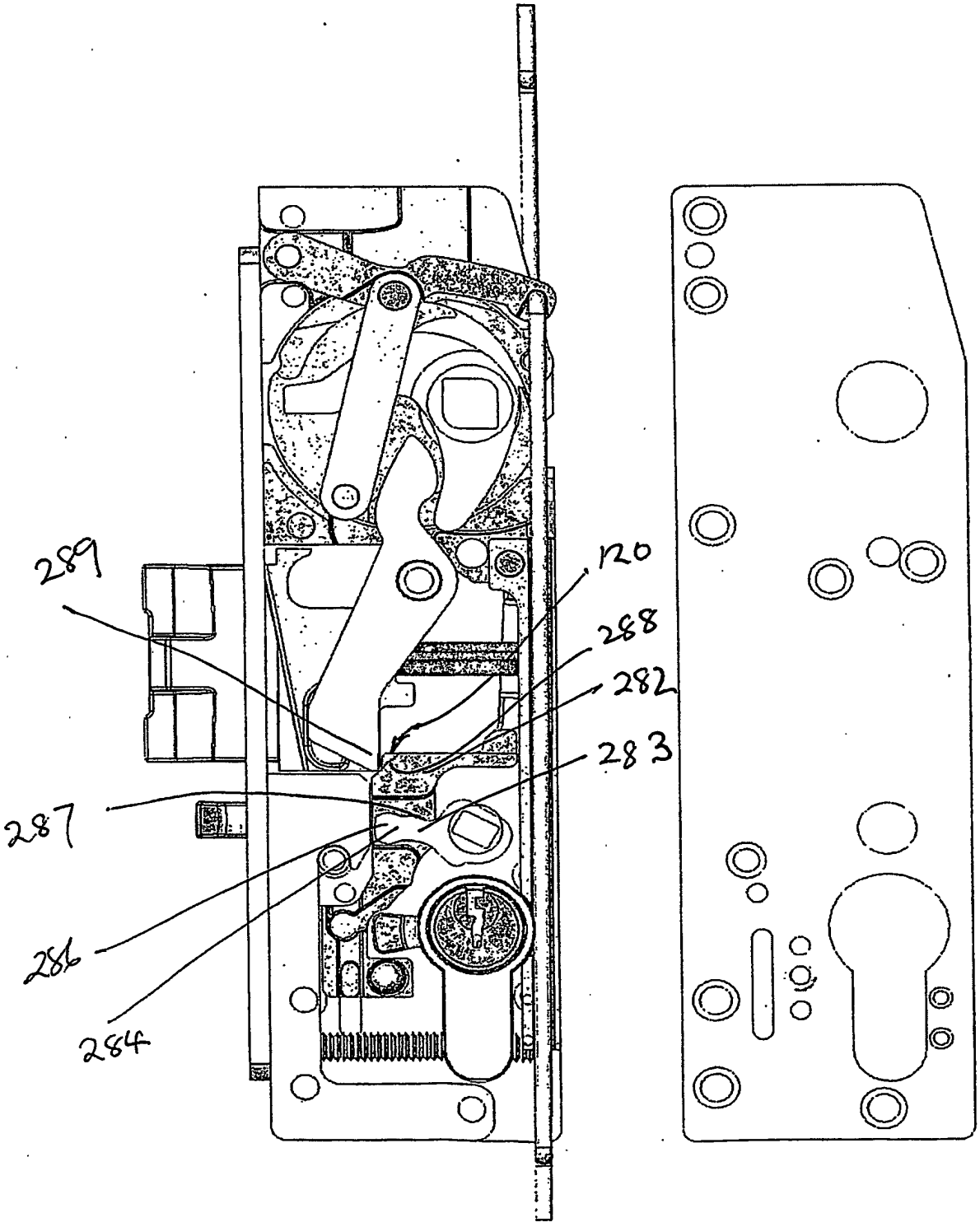

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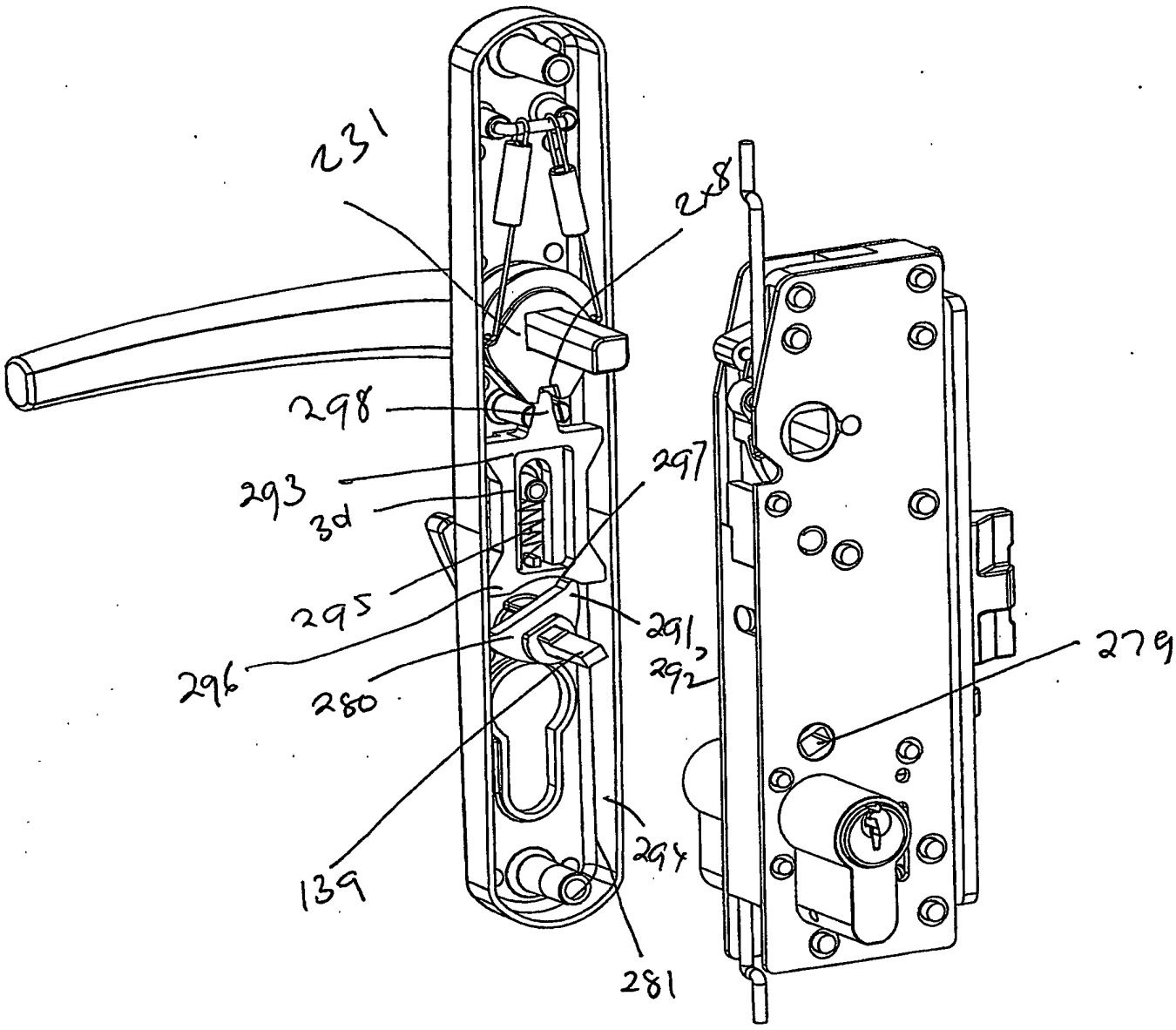
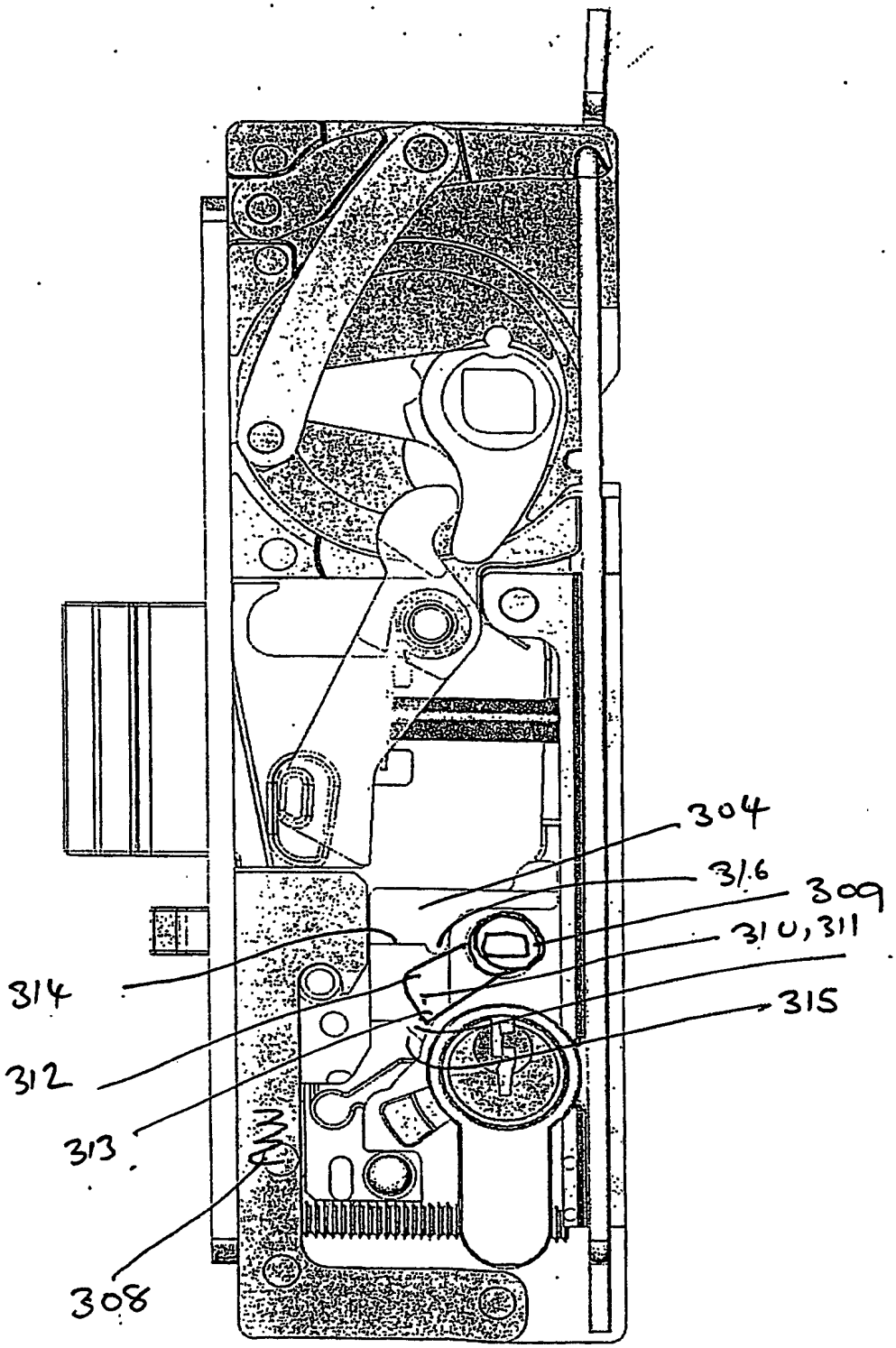


Fig 13



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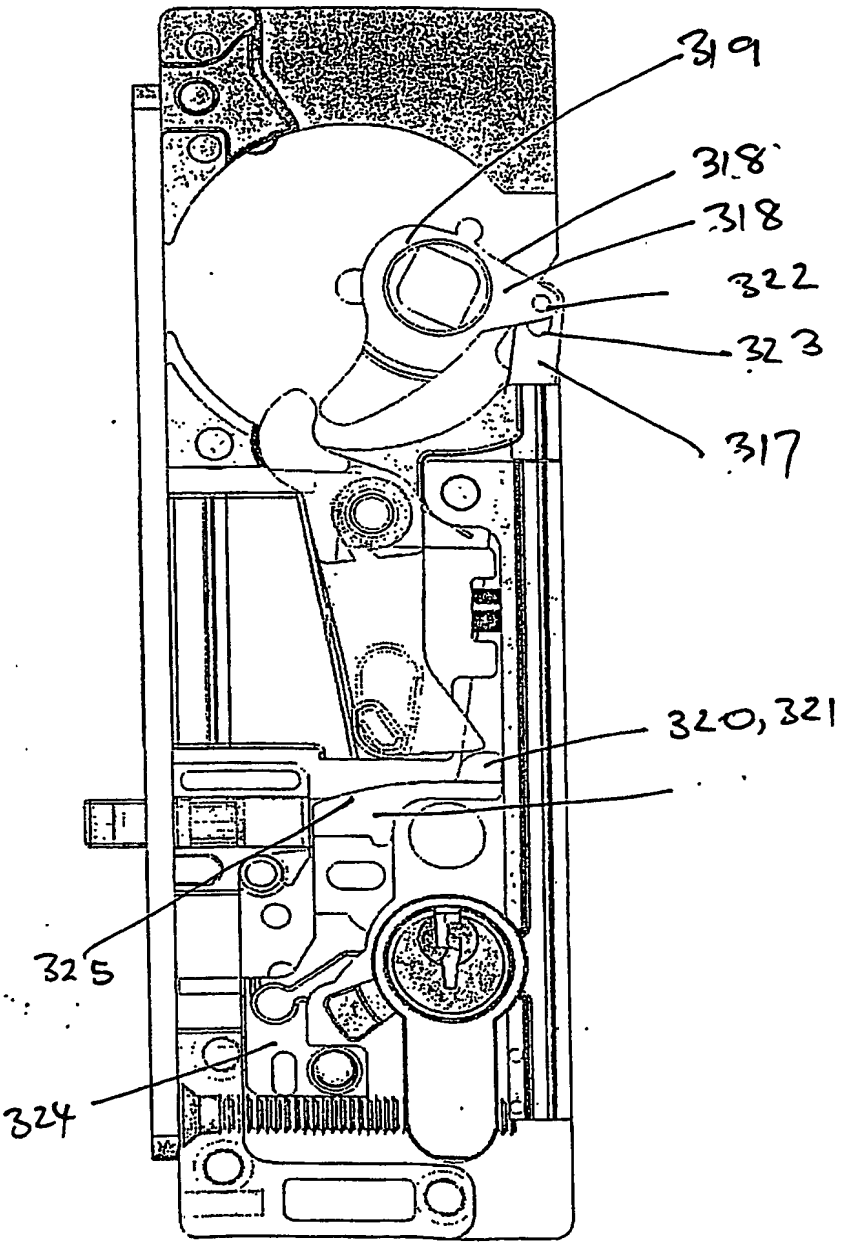


Fig 15

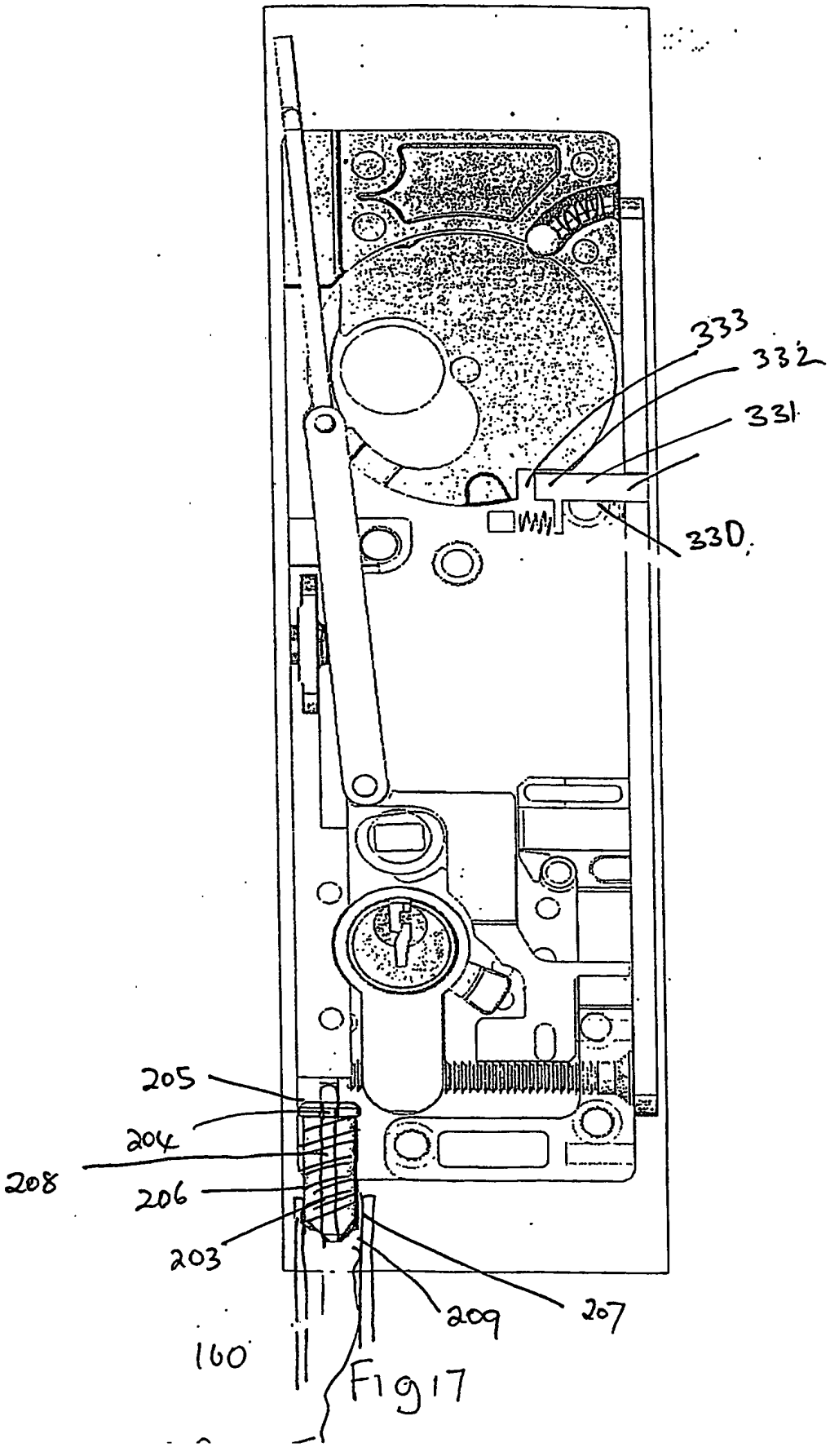


Fig 17

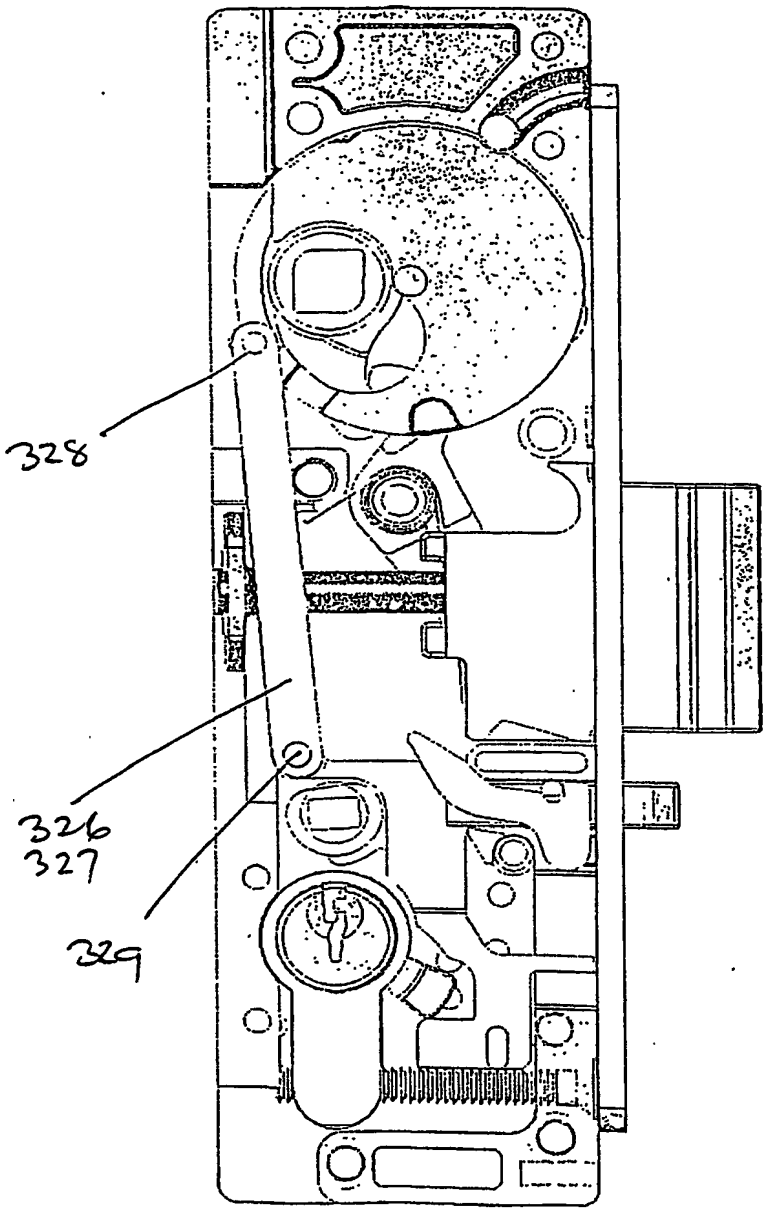


Fig 16

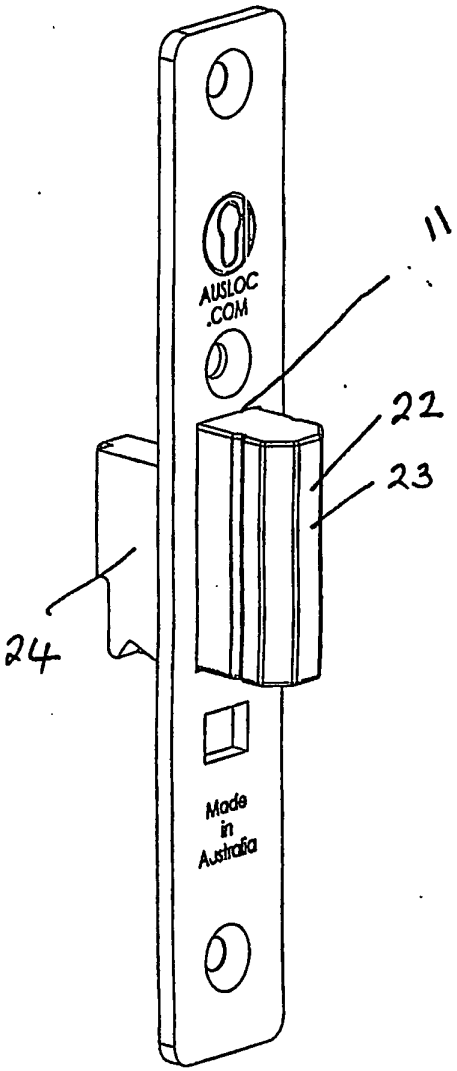


Fig 18

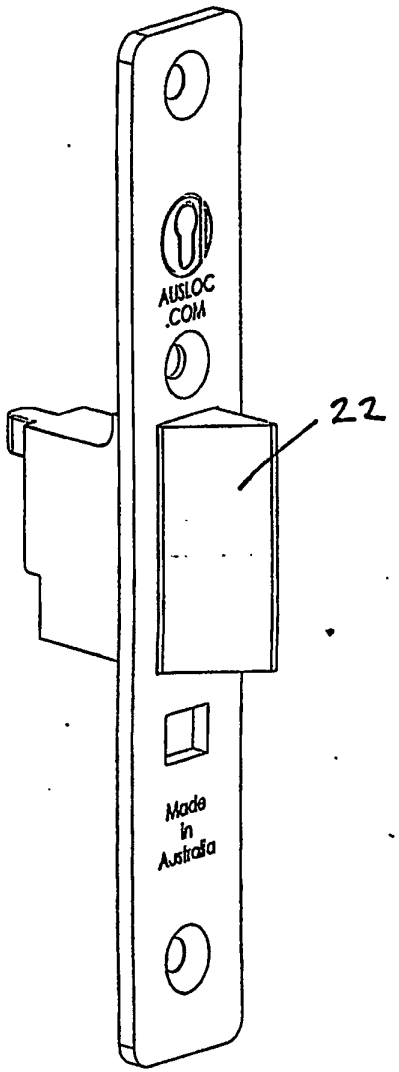


Fig 20

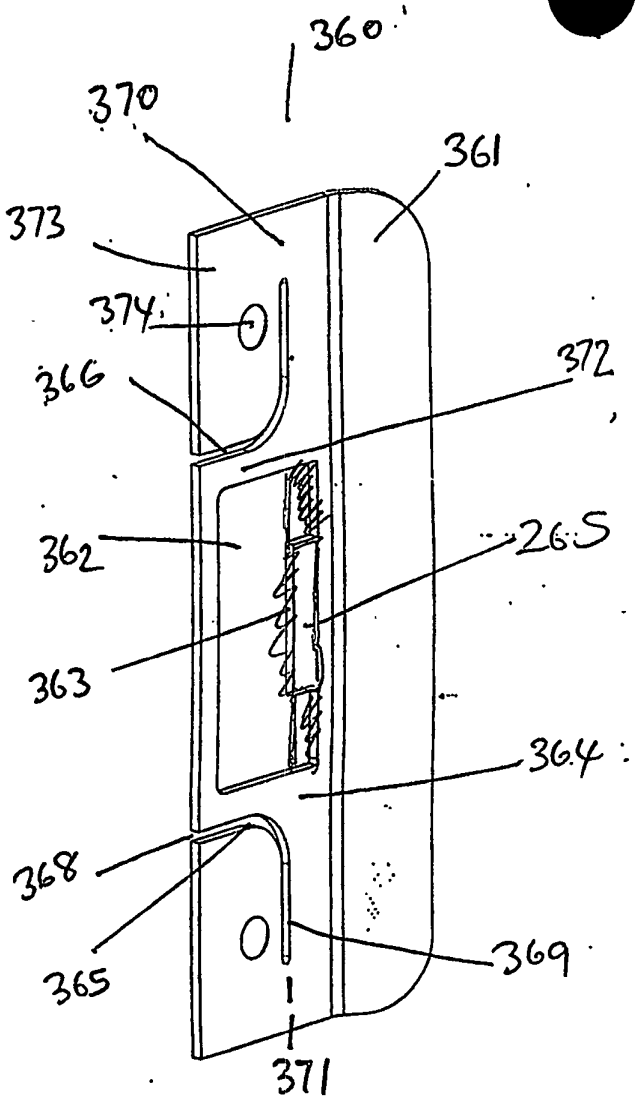


Fig 25

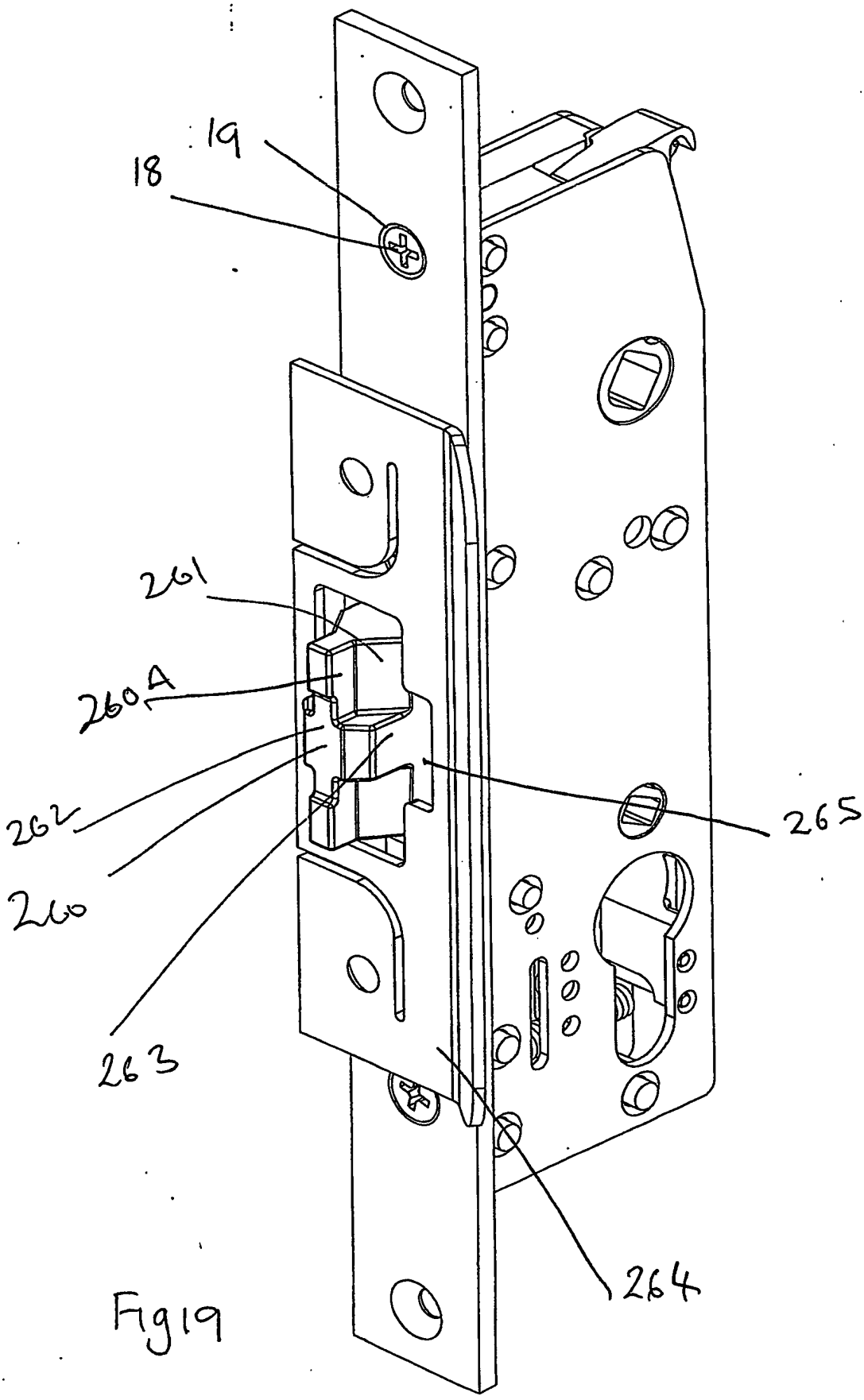


Fig 19

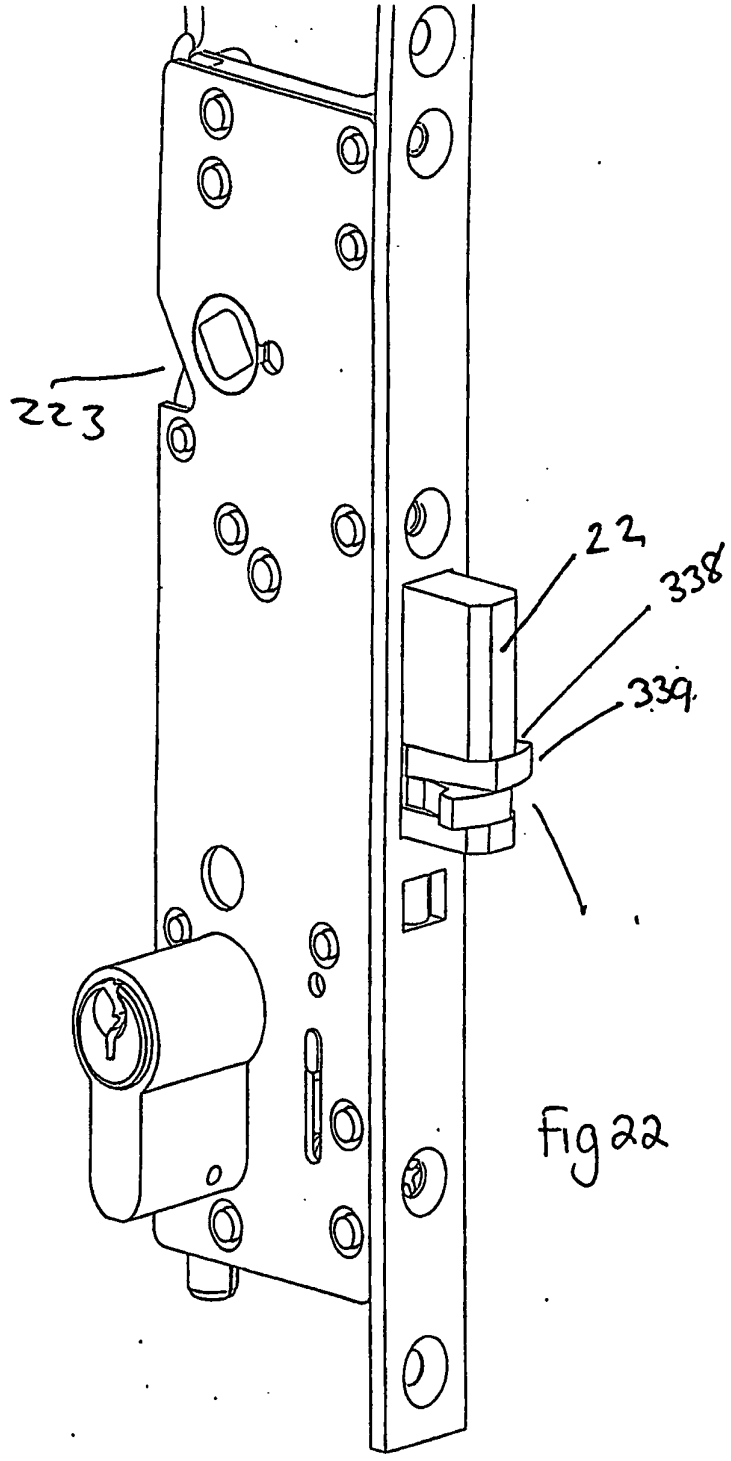
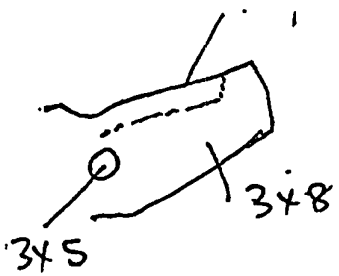


Fig 22



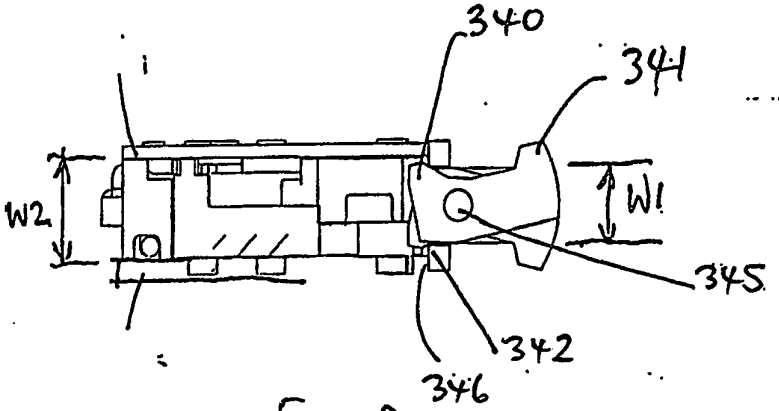


Fig 23

A-A

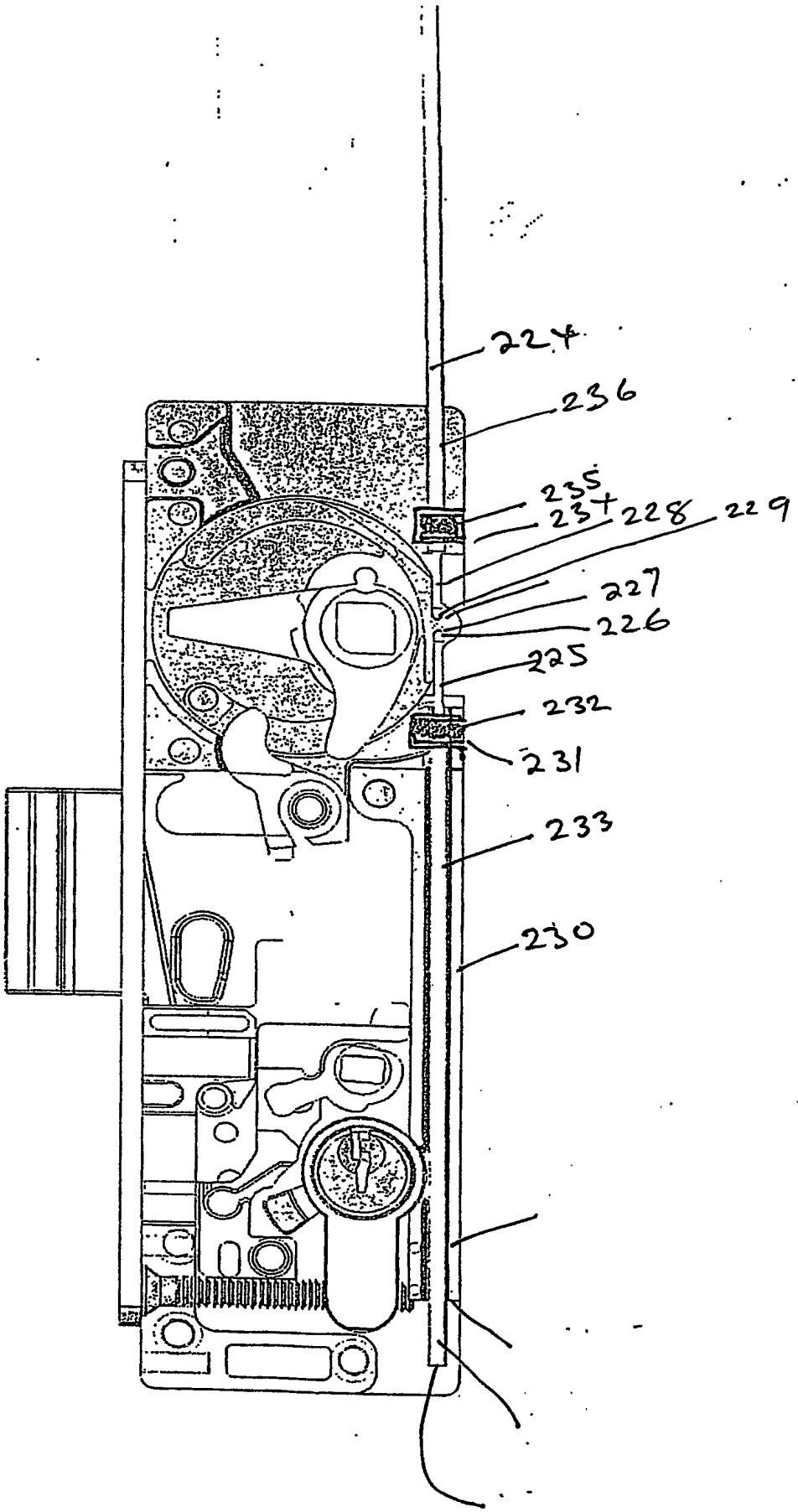
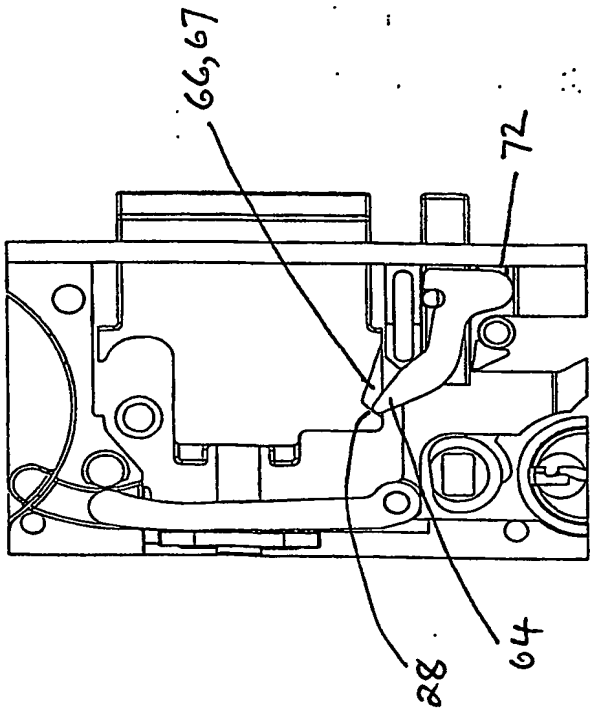


Fig 24



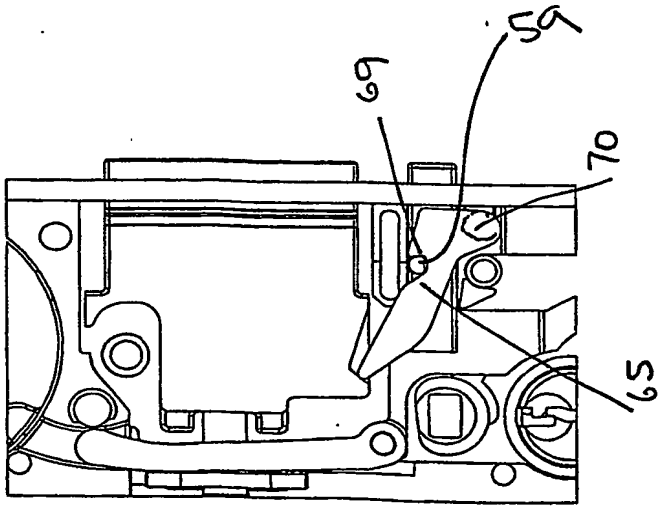


FIG. 26

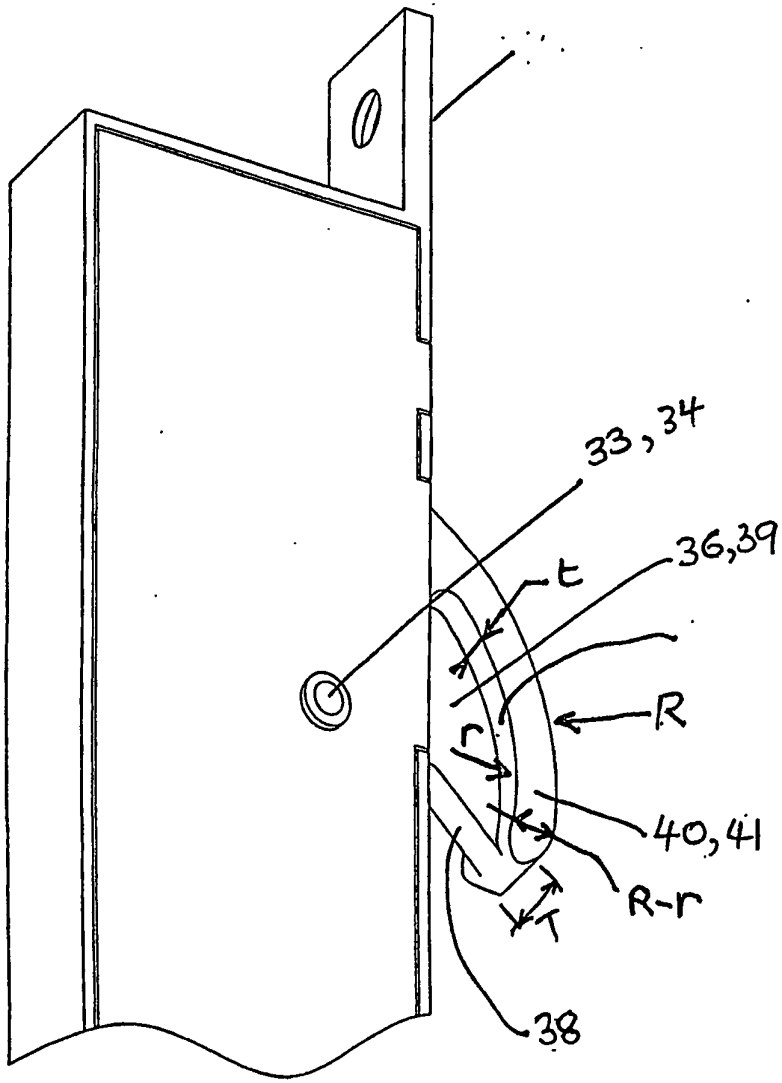


Fig 27

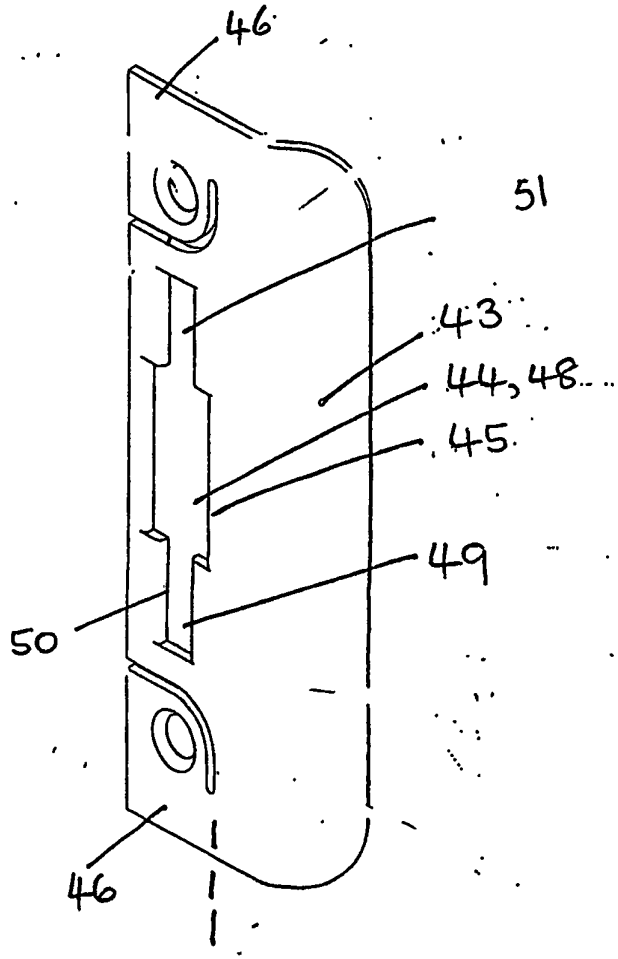


Fig 28

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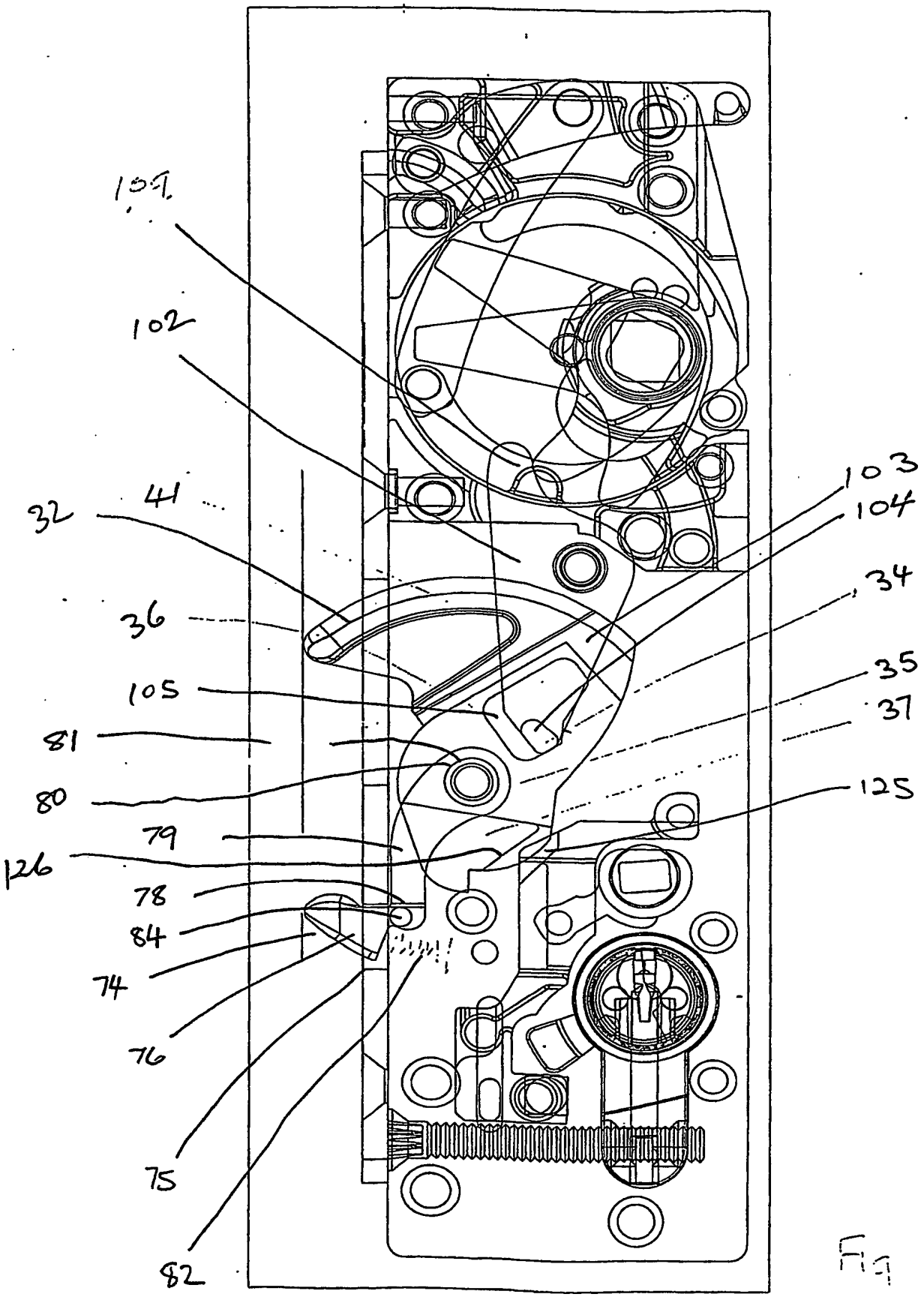
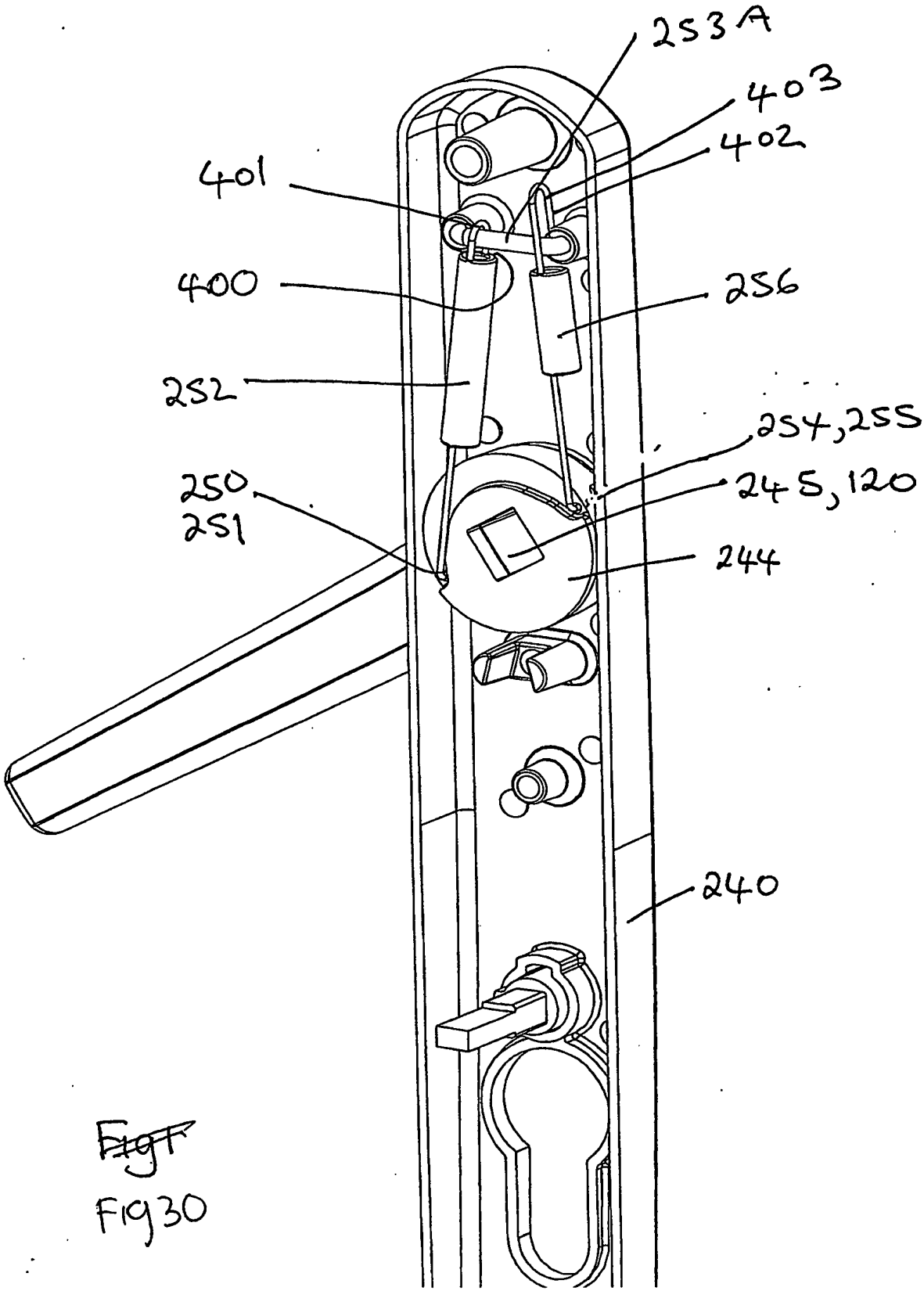


Fig 29



~~Fig1~~
Fig30

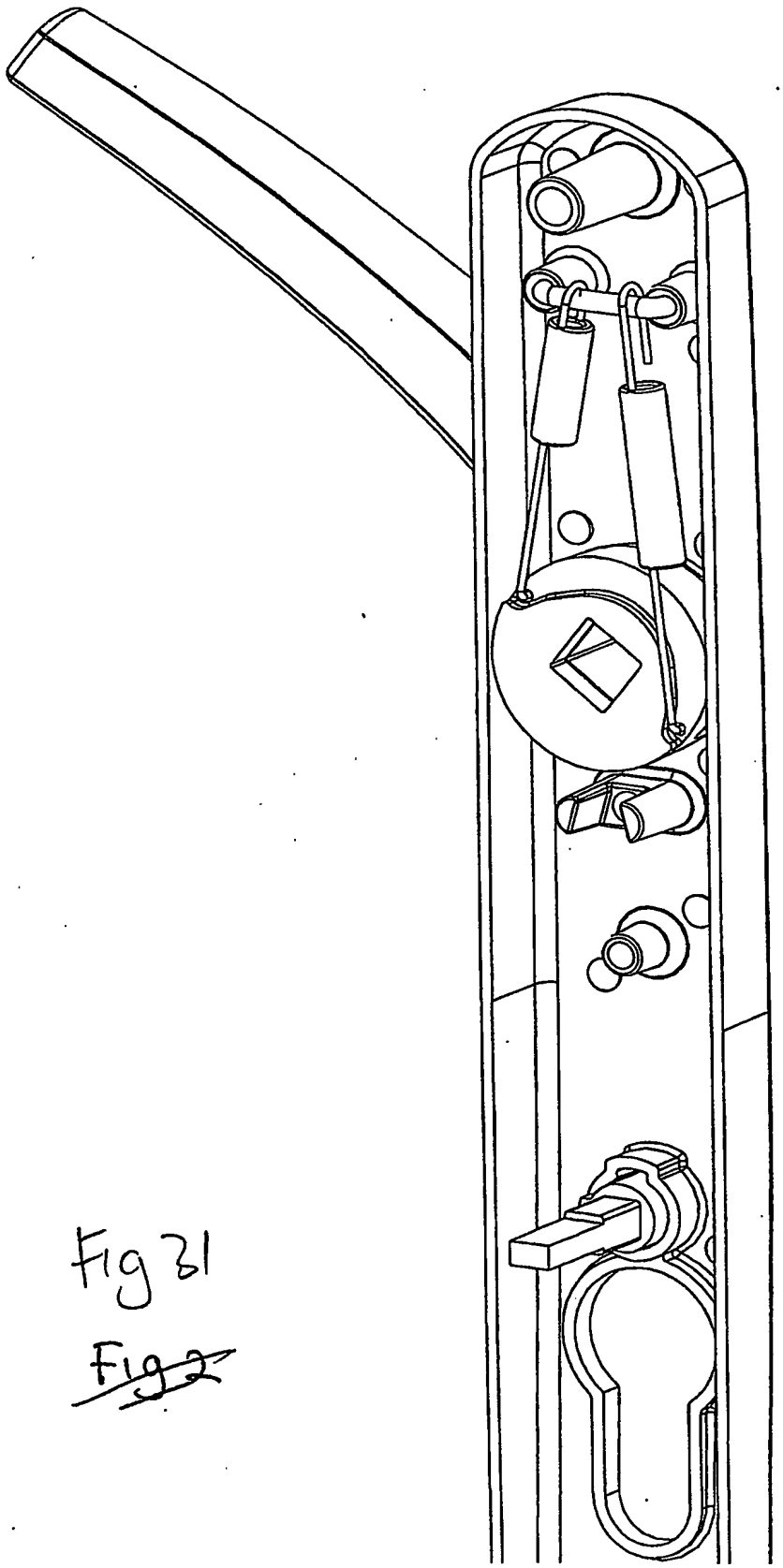


Fig 31

~~Fig 2~~

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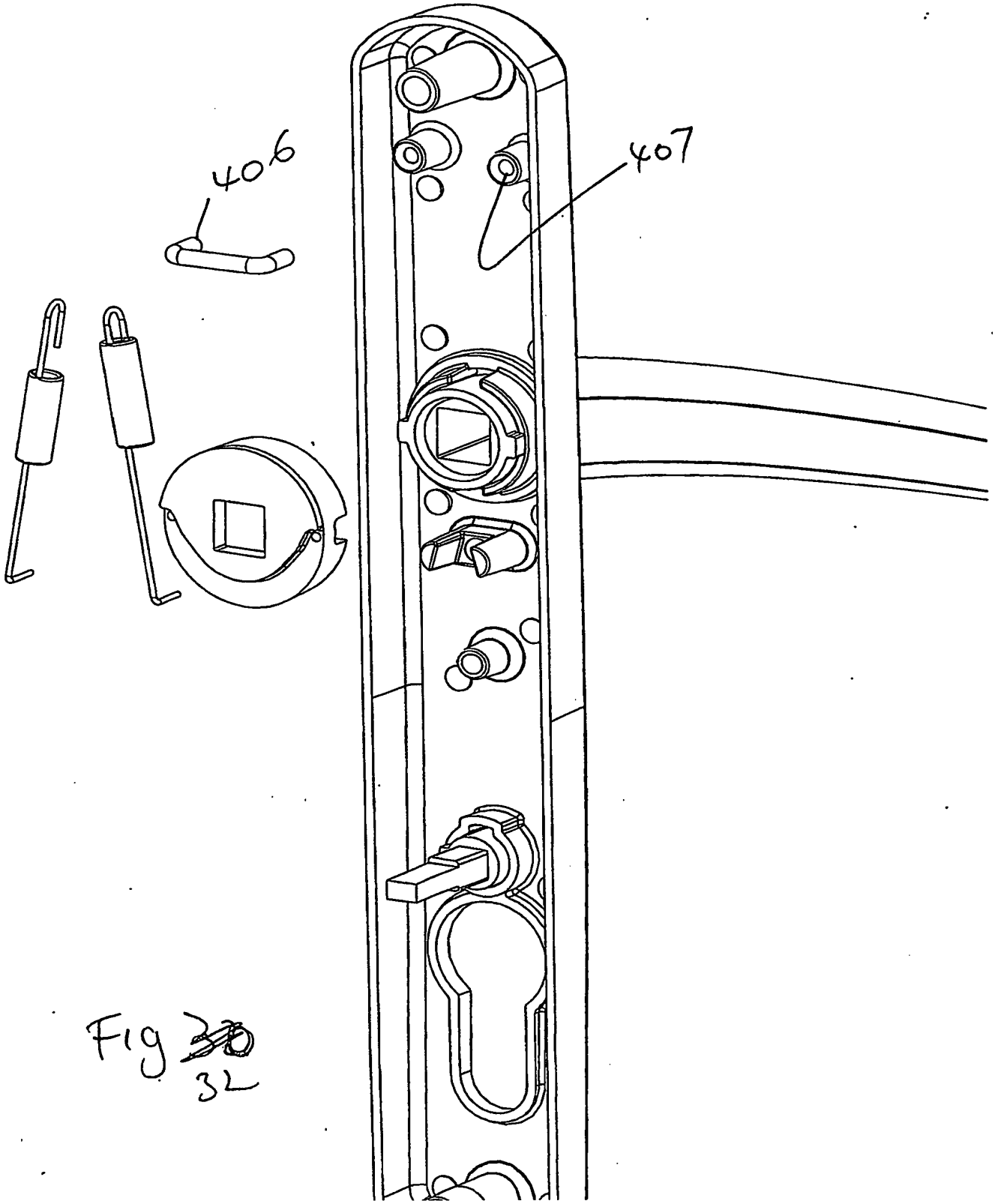

Fig ~~30~~ 32

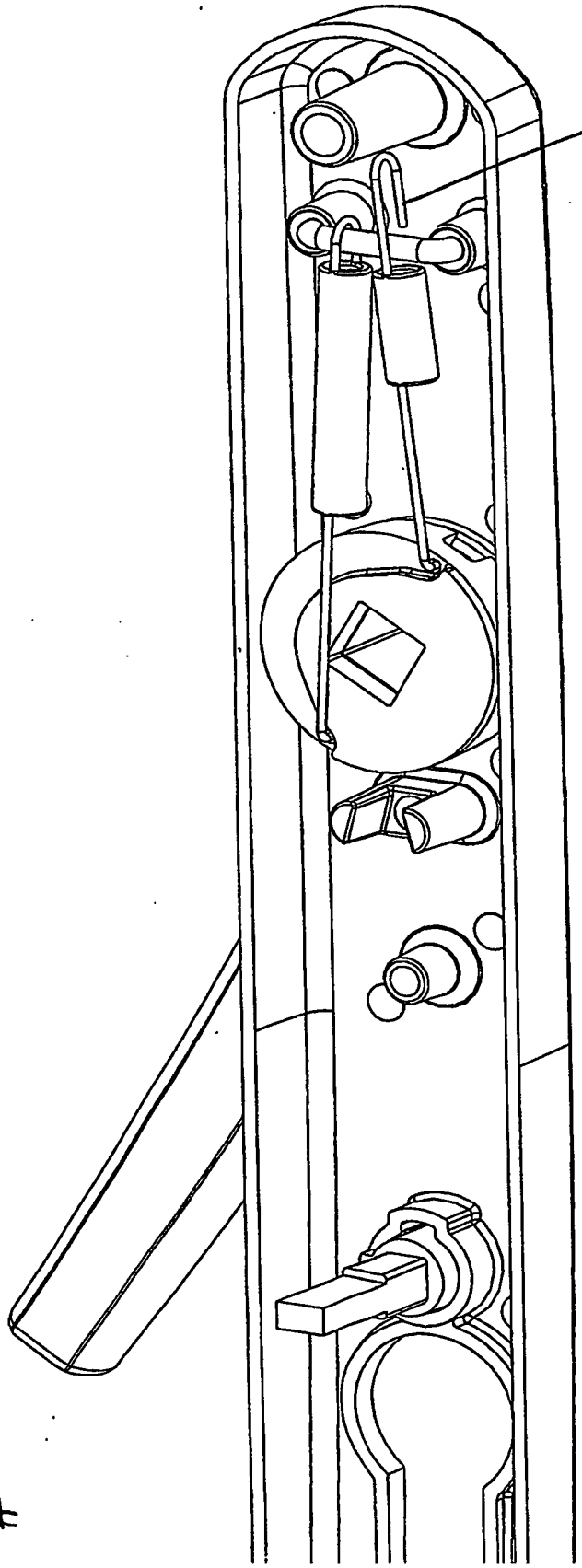

Fig 4

Fig 3B

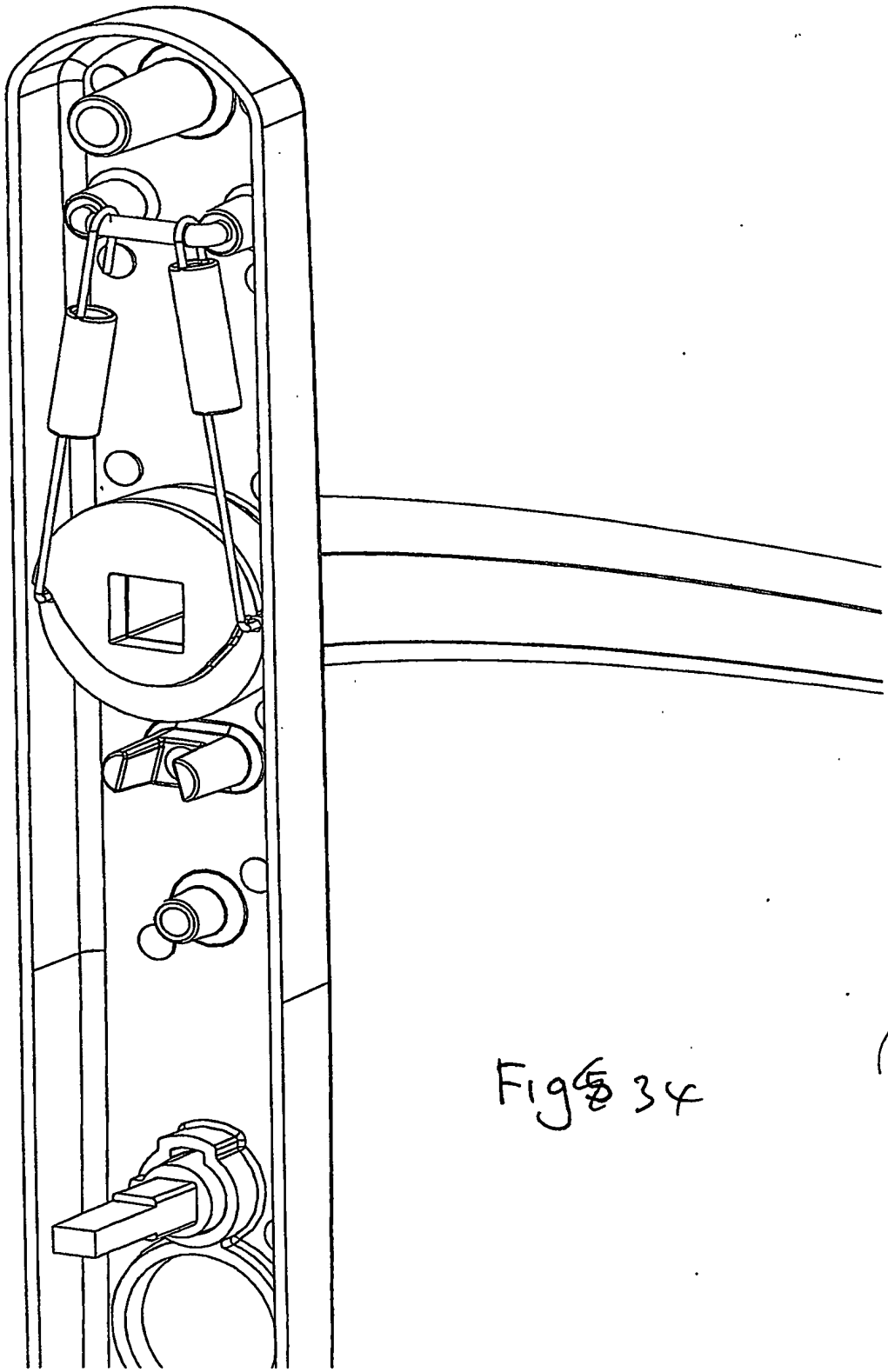

Fig 34